STUDY OF PREVALENCE OF CORONARY ATHEROSCLEROSIS IN BODIES SUBJECTED TO AUTOPSY BELONGING TO AGE GROUP 21-40 YEARS IN LOCAL POPULATION

DISSERTATION

SUBMITTED TO TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY,

CHENNAI

in partial fulfilment of

the requirements for the degree of

M.D. (FORENSIC MEDICINE)

BRANCH - XIV

TIRUNELVELI MEDICAL COLLEGE,

TIRUNELVELI- 627011

MAY 2019

CERTIFICATE

I hereby certify that this dissertation entitled **"STUDY OF PREVALENCE OF CORONARY ATHEROSCLEROSIS IN BODIES SUBJECTED TO AUTOPSY BELONGING TO AGE GROUP 21- 40 YEARS IN LOCAL POPULATION"** is a work done by **Dr. R. RAGURAM**, in the Department of Forensic Medicine, Tirunelveli Medical College, Tirunelveli, during his postgraduate degree course period from 2016 - 2019. This work has not formed the basis for previous award of any degree.

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PROTOCOL TITLE: STUDY OF PREVALENCE OF CORONARY ATHEROSCIEROSIS IN BODIES SUBJECTED TO AUTOPSY BELONGING TO AGE GROUP 21-40 YEARS IN LOCAL POPULATION
PRINCIPAL INVESTIGATOR: Dr.R.RAGURAM, MBBS

DESIGNATION OF PRINCIPAL INVESTIGATOR: POST GRADUATE STUDENT
DEPARTMENT & INSTITUTION: TIRUNELVELI MEDICAL COLLEGE, TIRUNELVELI

Dear , Dr.R.Raguram, MBBS., The Tirunelveli Medical College Institutional Ethics Committee (TIREC) reviewed and discussed your application during the IEC meeting held on 25.11.2016.

THE FOLLOWING DOCUMENTS WERE REVIEWED AND APPROVED

1.	TIREC Application Form	☐
2.	Study Protocol	☐
3.	Department Research Committee Approval	☐
4.	Patient Information Document and Consent Form in English and Vernacular Language	☐
5.	Investigator's Brochure	☐
6.	Proposed Methods for Patient Accrual Proposed	☐
7.	Curriculum Vitae of the Principal Investigator	☐
8.	Insurance /Compensation Policy	☐
9.	Investigator's Agreement with Sponsor	☐
10.	Investigator's Undertaking	☐
11.	DCGI/DGFT approval	☐
12.	Clinical Trial Agreement (CTA)	☐
13.	Memorandum of Understanding (MOU)/Material Transfer Agreement (MTA)	☐
14.	Clinical Trials Registry-India (CTRI) Registration	☐

THE PROTOCOL IS APPROVED IN ITS PRESENTED FORM ON THE FOLLOWING CONDITIONS

1. The approval is valid for a period of 2 year/s or duration of project whichever is later
2. The date of commencement of study should be informed
3. A written request should be submitted 3weeks before for renewal / extension of the validity
4. An annual status report should be submitted.
5. The TIREC will monitor the study
6. At the time of PI's retirement/leaving the institute, the study responsibility should be transferred to a person cleared by HOD
7. The PI should report to TIREC within 7 days of the occurrence of the SAE. If the SAE is Death, the Bioethics Cell should receive the SAE reporting form within 24 hours of the occurrence.
8. In the events of any protocol amendments, TIREC must be informed and the amendments should be highlighted in clear terms as follows:
   a. The exact alteration/amendment should be specified and indicated where the amendment occurred in the original project. (Page no. Clause no. etc.)
   b. The PI must comment how proposed amendment will affect the ongoing trial. Alteration in the budgetary status, staff requirement should be clearly indicated and the revised budget form should be submitted.
   c. If the amendments require a change in the consent form, the copy of revised Consent Form should be submitted to Ethics Committee for approval. If the amendment demands a re-look at the toxicity or side effects to patients, the same should be documented.
   d. If there are any amendments in the trial design, these must be incorporated in the protocol, and other study documents. These revised documents should be submitted for approval of the IEC, only then can they be implemented.
   e. Approval for amendment changes must be obtained prior to implementation of changes.
   f. The amendment is unlikely to be approved by the IEC unless all the above information is provided.
   g. Any deviation/violation/waiver in the protocol must be informed

STANDS APPROVED UNDER SEAL

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State of Tamilnadu, South India

Dr.J.Suresh Durai, MD
Member Secretary, TIREC
Tirunelveli Medical College, Tirunelveli – 627011
State of Tamilnadu, South India

CERTIFICATE – II

This is certify that this dissertation work title **"STUDY OF PREVALENCE OF CORONARY ATHEROSCLEROSIS IN BODIES SUBJECTED TO AUTOPSY BELONGING TO AGE GROUP 21-40 YEARS IN LOCAL POPULATION"** of the candidate **Dr.R.RAGURAM,** with registration Number **201624101** for the award of **M.D.** Degree in the branch of **FORENSIC MEDICINE (XIV).** I personally verified the urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion page and result shows **6 percentage** of plagiarism in the dissertation.

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INTRODUCTION

As renowned American cardiologist Paul Dudley White said in 1951 in his classic book HEART DISEASE , "The ideal goal towards which mankind should strive is to control cardiovascular threats so that one lives a healthy, happy and useful youth and middle age life till an advanced age – a point at which even sudden death from cardiovascular disease itself wouldn't have to be regretted"

Death is the cessation of all biological functions that sustain a living organism. Phenomena which commonly bring about death include aging, predation, malnutrition, disease, suicide, homicide, starvation, dehydration, and accidents or major trauma resulting in terminal injury.

In older era Infectious/communicable diseases were considered to be leading killers of human race. But recent study of deaths shows heart diseases have replaced communicable diseases as the biggest killer in rural & urban India and the world. Heart diseases have emerged as the number one killer in both urban and rural areas of the country. About 9.5 million deaths, which is about one in six deaths worldwide, occur in the country every year. In India over three- quarters of these deaths take place in the home and more than half of these do not have a certified cause.

The majority of these are natural deaths, but very often natural deaths form the basis of medico-legal investigations especially if they had occurred suddenly and unexpectedly in apparently healthy individuals and more importantly if death had occurred under suspicious circumstances. In such cases it is not possible to certify the cause of death only on external examination but autopsy is imperative to determine the precise cause of death and to obviate the possibility of unnatural death.

Coronary artery disease (**CAD**), also known as **ischemic heart disease** (**IHD**) refers to a group of diseases which includes stable angina ,unstable angina, myocardial infarction and sudden cardiac death and contribute greatly to overall mortality and morbidity statistics of both India and globally .In 2015 CAD affected 110 million people and resulted in 8.9 million deaths. It makes up 15.9% of all deaths making it the most common cause of death globally.

Myocardial infarction (MI), commonly known as a heart attack, occurs when blood flow decreases or stops to a part of the heart, causing damage to the heart muscle and causes tissue death (infarction) of the myocardium. It is a type of acute coronary syndrome, which describes a sudden or short-term change in symptoms related to blood flow to the heart. Worldwide 15.9

million myocardial infarctions had occurred in the year 2015. The phrase "heart attack" is often used non-specifically to refer to a myocardial infarction and to sudden cardiac death. An MI is different from—but can cause—cardiac arrest, where the heart is not contracting at all or so poorly that all vital organs cease to function, thus causing death. It is also distinct from heart failure, in which the pumping action of the heart is impaired.

The most common cause of a myocardial infarction is the rupture of an atherosclerotic plaque on a coronary artery supplying heart muscle. Plaques can become unstable, rupture, and additionally promote the formation of a blood clot that can completely block the coronary vasculature which can occur within span of minutes. Total Blockage of an artery can lead to cellular death in particular tissue which is being supplied by that particular branch of artery. Atherosclerotic plaques are often present for decades before they result in symptoms.

Atherosclerosis is a distinctive form of arteriosclerosis known from ancient times. The terms ‘athere’ (meaning-porridge) and sclerotic (hardening or fibrosis) derived from Greek terminology, do not represent the complete morphology of disease. Despite our familiarity with this disease, some of its fundamental characteristics remain poorly recognized and understood. The

cause and pathogenesis of atherosclerosis remains subject of lively speculation and controversy. Atherosclerosis is a pathological entity and a multifactoid disease of large and medium sized arteries, characterized by plaque like intimal deposits which contain neutral fats, cholesterol, lipophages, blood elements, at times, other evidence of hemorrhage and calcium deposits. Complications of which are disastrous – ischemic heart disease, cerebral stroke, peripheral gangrene and so on. It is a pandemic and atherosclerosis is overwhelmingly the prime disorder leading to death and serious morbidity. Despite recent reduction in mortality of coronary heart diseases (CHD) about 45% of all deaths in US are still attributable to atherosclerosis related diseases. The developing countries such as India, Singapore, Malaysia and Sri Lanka are catching up and registering a steady increase in the mortality rates due to atherosclerotic heart diseases. In India coronary heart disease accounts for 10-15% of all cardiovascular diseases and contributes to around 35% of total mortality data.

Atherosclerosis can lead to various complications like myocardial infarction (MI), stroke, embolization, ulceration, thrombosis, and aneurysm which cause considerable morbidity and mortality, thus affecting the lifespan and the quality of life of a large segment of population.

Atherosclerosis is a complex and common disease contributing to increased mortality and morbidity. The exact global incidence of atherosclerosis is beyond calculation. Autopsy studies can provide information about the impact and course of atherosclerosis. Present study is undertaken to study the spectrum and distribution of atherosclerotic lesions in the coronary arteries and their association of age and sex.

Some studies show that atherosclerotic lesions start developing at an earlier age and are found to be in more advanced stages in Indian population as compared to the patients in western countries.

The exact global incidence of atherosclerosis is impossible to calculate because it can exist without producing any symptoms or signs. These asymptomatic cases can be diagnosed only if an autopsy is done, in all cases of death due to any cause. However, the magnitude of the problem can be assessed by looking at the mortality rates in different countries due to atherosclerotic heart disease.

Although global incidence, a wide range of variation in the prevalence and severity of atherosclerosis has been shown to exist in different geographic population. Against this background the present study has been taken in order to determine the severity and distribution of coronary atherosclerosis in the

bodies subjected to autopsy at our mortuary which has good representation of all social classes.

Assessment of atherosclerotic lesions in living subjects is difficult and almost nonexistent due to its invasive nature and can be an expensive enterprise. Hence, autopsy-based study of coronary vessels and aorta, has emerged as an invaluable tool for studying these atherosclerotic lesions in deceased subjects. It will be a true representation of distribution and prevalence of atherosclerotic lesions present in the population if an autopsy study is conducted on deceased patients

Hence this study was undertaken to find out the prevalence of atherosclerosis in coronary vasculature in age group belonging to age group 21 to 40 and their distribution along the vessels were studied and correlated with age and sex.

AIM OF THE STUDY

To study the prevalence of atherosclerosis in coronary vasculature in bodies of ages 21-40 subjected to autopsy and to grade the atherosclerosis and determine their correlation with age and sex.

OBJECTIVES OF THE STUDY

At present, number of deaths due to natural cause being subjected to autopsy is on a rise and most are related to cardiac events in which myocardial infarction has a higher proportion. Most clinical practices suggests cardiac screening/workup after age of 40 if with risk factors and more than 45 if without any risk factors to contribute. My present work is to find out whether there is any change needed in those screening ages to detect atherosclerotic changes at an early stage/age so as to decrease the mortality caused by these cardiac events.

RISKS, (if any):

- No risk to the subject/deceased.
- No risk of mutilation of bodies.
- No risk to the examiner.

INSTITUTIONAL ETHICAL COMMITTEE CLEARANCE:

Obtained before collecting samples.

PLACE OF STUDY:

1. Mortuary Hall and Research lab of the Department of Forensic Medicine, Tirunelveli Medical College, Tirunelveli.
2. Department of Pathology, Tirunelveli medical college, Tirunelveli

METHODOLOGY:

100 cases with known age at death belonging to 21 -40, bought for medico legal autopsy at our department are selected. Heart is removed as per standard textbook procedures and examined both gross and histopathologically and degree of atherosclerosis , if present is graded and results compiled out.

OUTCOME & BENEFITS:

If prevalence of coronary atherosclerosis is high and significant, screening ages can be modified to an earlier cut off so as to detect and subsequently decrease the mortality rate of cardiac related deaths.

NATIONAL SIGNIFICANCE:

As coronary events are major natural killer in our country, we can reduce the mortality rates if screening and identification/treatment of cases is done at an early age and avoid sudden adverse cardiac events which vastly affects the quality of life of an individual and their family and also to improve overall quality of health of the nation.

MATERIALS & METHODS:

Cases are selected from the bodies received for medico legal Autopsies during the period of study. Study comprises of 100 cases with known age at death. Ages from 21 to 40 years of both sexes are included in the study.

Age at death is taken from the details given by the Police / Magistrate (depending upon the case) in their post mortem requisition and case history. Since the samples are taken as a part of routine medico-legal examination consent is not required for the study.

METHODS:

General Examination of body of the deceased received for autopsy is first done to rule out any external injury affecting the heart, dismembered bodies and decomposed bodies.

SAMPLE SIZE:

100 cases with known age at death.

INCLUSION CRITERIA:

1. Bodies subjected to post mortem examination belongs to age greater than or equal to 21years and less than 40 years and includes both sexes.

EXCLUSION CRITERIA:

1) Dismembered and disfigured cases.
2) Nutritional deficiency (if demonstrable during autopsy).
3) Different ethnicity (migratory population).
4) Tourists from other states.
5) Pericardial damage.
6) Pericardial adhesions.

STUDY PERIOD:

One and half year.

PLACE OF STUDY:

1) Autopsy Hall,

   Department of Forensic Medicine & Toxicology,

   Tirunelveli Medical College,

   Tirunelveli.

2) Department of pathology,

Tirunelveli Medical College,

Tirunelveli.

TECHNIQUE

After opening the thoracic cavity the pericardial sac is examined for any abnormality if present. The pericardial sac is opened by an anterior midline incision with scissors. The heart is held at the apex and lifted upwards. It is isolated by cutting the vessels that enter and leave the heart namely superior vena cava ,inferior vena cava, pulmonary trunk and the aorta as far away from the heart's base. The isolated heart is then studied and its size and weight measured. At first the right coronary artery and left coronary artery are tracked starting right from the ostia which is first inspected for any occlusion or congenital variations. The right coronary artery and left coronary artery are inspected for any gross changes like segmentation and are examined by making a series of cross incisions down the course of vasculature about 2-3mm apart by a scalpel to demonstrate any narrowing due to plaque or antemortem thrombus. This method clearly shows the narrowing of vasculature and antemortem thrombus (if present) without the danger of dislodging it. If any narrowing of coronary vessels is present, a longitudinal cut with fine scissors is used for better measure of the extent of

atherosclerotic disease. The sample is then fixed in formalin and taken to Department of Pathology for histopathological examination for confirmatory report.

GRADING

The stenosis of coronary vessels is graded based on the luminal narrowing and are grouped according to AMERICAN HEART ASSOCIATION grading system.

Grade 0: Normal

Grade 1: 1% - 25% stenosis

Grade 2:26%- 50% stenosis

Grade 3:51%-75% stenosis

Grade 4:76%-100% stenosis

REVIEW OF LITERATURE

GRAY'S ANATOMY states "two coronary arteries arise from aortic sinuses in the initial portion of the ascending aorta and supply the muscle and other tissues of the heart. They circle the heart in coronary sulcus, with marginal and interventricular branches, in the interventricular sulci, converging towards the apex of the heart. The returning venous blood passes through the cardiac veins and most of it empty into the coronary sinus which is located on the posterior surface of the heart between left atrium and left ventricle and it empties directly into the right atrium of the heart between the opening of the inferior vena cava and right atrio-ventricular orifice.

The right coronary artery branches from the right aortic sinus of the ascending aorta and passes anterior and to right between the right auricle and the pulmonary trunk after which it descends vertically between the right atrium and the right ventricle in the coronary sulcus. Reaching the inferior margin of the heart, it continues in the sulcus onto the diaphragmatic surface and the base of the heart. During its course following branches arise from right coronary artery

1. An early atrial branch gives off the sinu-atrial nodal branch which passes posteriorly around the superior vena cava to supply the sinu-atrial node
2. A right marginal branch arises as the right coronary approaches the inferior margin of the heart
3. A small branch to atrio-ventricular node as the right coronary artery passes on the base/diaphragmatic surface of the heart
4. Posterior interventricular branch, its final branch, which lies in the posterior interventricular sulcus.

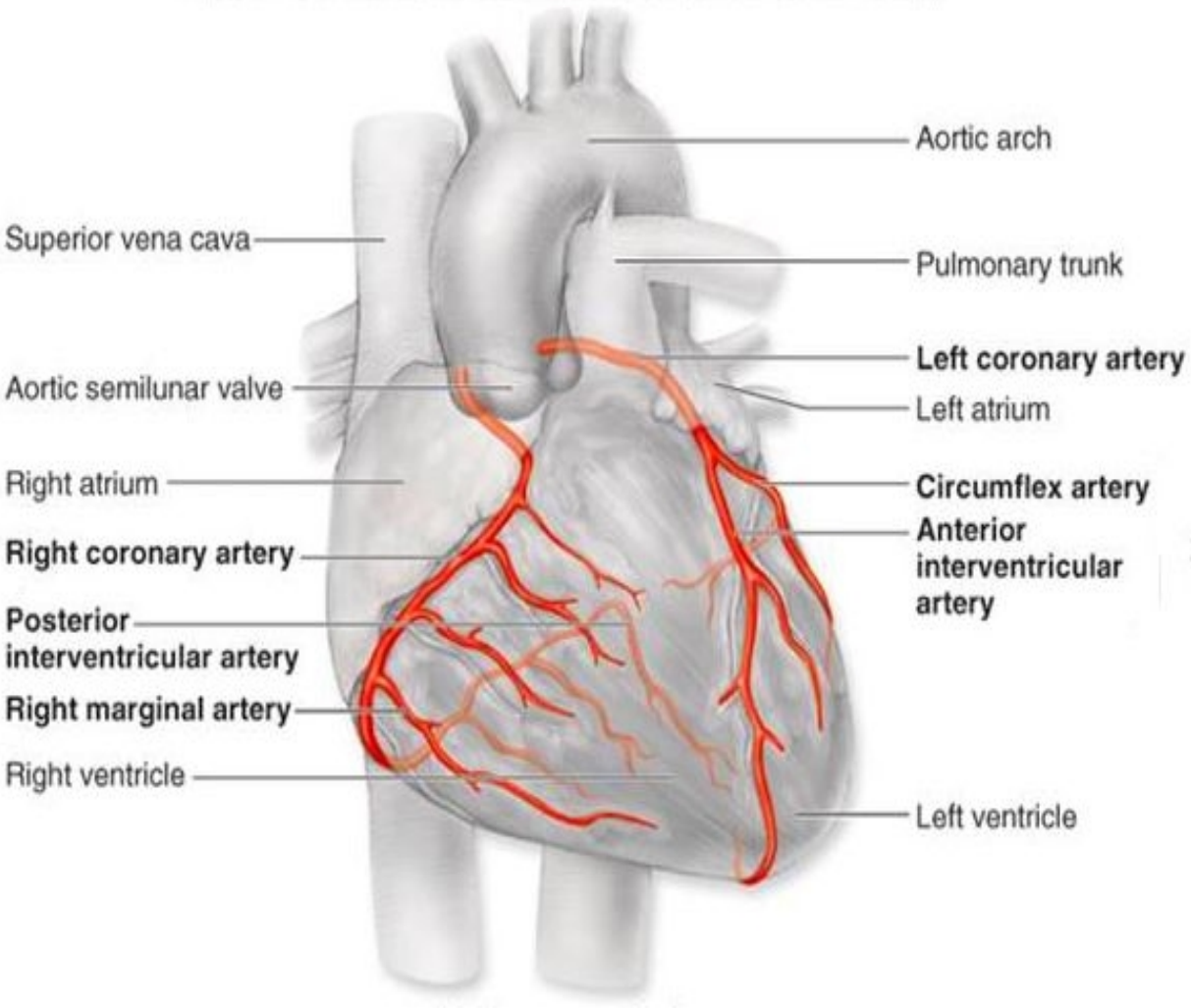
The right coronary artery supplies the right atrium and right ventricle, the sinu-atrial node , the atrio-ventricular node, the inter atrial septum, a portion of left atrium, postero inferior one third of the interventricular septum and a small part of posterior part of the left ventricle.

The left coronary artery branches from the left aortic sinus of the ascending aorta passing between the pulmonary trunk and the left auricle before entering the coronary sulcus. Posterior to the pulmonary trunk , the

artery divides into 2 terminal branches, the anterior interventricular and the circumflex.

1. The anterior interventricular branch continues around the left side of the pulmonary trunk and descends obliquely toward the apex of the heart in the anterior interventricular sulcus. During its course, one or two large diagonal branches descend diagonally across the anterior surface of the left ventricle.
2. The circumflex branch continues to the left in the coronary sulcus and onto the base/diaphragmatic surface of the heart. It usually ends before reaching the posterior interventricular sulcus. A large branch the left marginal artery usually arises from it and continues across the rounded obtuse margin of the heart.

   The left coronary artery supplies most of the left atrium and the left ventricle and most of the interventricular septum including the atrio-ventricular bundle and its branches."[1]



CORONARY VASCULATURE

ROBBINS states “Atherosclerosis is characterized by intimal lesions called atheromas or atheromatous or fibrofatty plaques which protrude into and obstruct vascular lumens and weaken the underlying media. This may lead to serious complications. Global in distribution, atherosclerosis overwhelmingly contribute to more mortality approximately half of all deaths and serious morbidity in western world than any other disorder. Epidemiological data on atherosclerosis are usually presented in terms of frequency of the number of deaths caused by ischemic heart disease (IHD).

The prevalence and severity of the disease among individuals and groups and therefore the age when it is likely to cause tissue or organ injury are related to a number of factors some constitutional but others are acquired and potentially controllable. The constitutional factors include age, sex, genetics.

Age is a dominant influence. Death rates from ischemic heart disease rise with each decade. Even into advanced age, atherosclerosis is not clinically evident until middle age or later when the arterial lesions participate

in organ injury. Between ages 40 – 60 the incidence of myocardial infarction increases five fold.

Males are much more prone to atherosclerosis and its consequences than females. Myocardial infarction and atherosclerosis related consequences are very uncommon in premenopausal women, unless they are predisposed by diabetes, hyperlipidemia or severe hypertension. Post menopausal women, however the incidence of myocardial infarction and atherosclerosis related consequences/ complications increases probably due to a decrease in a natural estrogen levels. The incidence of myocardial infarction equalizes by the seventh or eighth decade of life.

The well established familial predisposition to atherosclerosis and ischemic heart disease is most likely polygenic. Most commonly the genetic propensity relates to familial clustering of other risk factors such as hypertension or diabetes while less commonly it involves well defined hereditary genetic derangements in lipoprotein metabolism that results in excessively high blood lipid levels such as familial hypercholesterolemia.

In more than 90% of the cases, the cause of myocardial ischemia is reduction in coronary blood flow due to atherosclerotic coronary arterial occlusion in most cases there is a long period (decades) of silent, slowly progressive, coronary atherosclerosis before these disorders become manifest.

Thus, the syndromes of ischemic heart disease are only the late manifestations of coronary atherosclerosis that probably began during childhood or adolescence.

More than 90% of patients with ischemic heart disease have atherosclerosis in one or more of the coronary arteries. A fixed obstructive lesion of 75% or greater (i.e., only 25% or less lumen remaining) generally cause symptomatic ischemia. A 90% stenosis can lead to inadequate coronary blood flow even at rest."[2]

ANDERSON states "Of the variety of diseases that affect the coronary arteries the most important and the most common is the atherosclerosis. The vascular disease can be present with or without clinical or pathological

evidence of myocardial damage. The WHO's study group on atherosclerosis and ischemic heart disease defined IHD as , cardiac disability, acute and chronic, arising from reduction or total arrest of blood supply to the myocardium in association with disease processes in the coronary arterial system.

Cardiac disease from coronary atherosclerosis and its complications referred to as atherosclerotic coronary artery disease includes such features as angina pectoris, myocardial infarction, myocardial atrophy and fibrosis, congestive heart failure, cardiac hypertrophy and dilation and sudden death caused by cardiac arrest or ventricular fibrillation with or without anatomic evidence of myocardial disease.

Just as heart disease is the leading cause of death in the world, coronary heart disease, especially the atherosclerotic type, is the chief form of fatal cardiac disease. Ischemic heart disease accounts for 88% of all deaths due to cardiac cause. Most of the deaths from ischemic heart disease occur at ages 35 – 74 years. Generally death rates for various age groups are higher in males compared to females. The difference decreases progressively with age. One of

the complications of coronary atherosclerosis is gradual increase in size of the lesion in the lumen of the artery, leading to varying degree of luminal occlusion and in some cases even to the point of complete occlusion.

In association with atherosclerosis, coronary thrombosis is a major cause of coronary occlusion. Thrombi are usually found at sites of narrowing in the sclerotic arteries" [3]

OXFORD'S TEXTBOOK OF PATHOLOGY states "if the adjective sudden is applied to deaths occurring within 6hour of the onset of symptoms in a previously symptom free individual, then ischemic heart disease accounts 60% of the fatalities. Even if the time period is reduced to 15 min, the proportion of deaths due to ischemic heart disease does not change. 40% of all deaths attributable to ischemic heart disease falls into this category, a clinical problem of enormous magnitude when one considers the frequency of ischemic heart disease as a cause of death.

In addition, half the patients dying suddenly from IHD are said to have been unaware that they were suffering from cardiovascular disease. Quantitative data of this kind re-emphasize the importance of prevention as

opposed to treatment of established disease, if significant reductions in mortality- the body count – are to be obtained"[4]

EMANUEL RUBIN states "the term ischemic heart disease is applied when clinical signs and symptoms of myocardial ischemia are present and persistent, and when the supply of oxygen in coronary arterial blood is inadequate to provide for the oxygen demands of the heart. The major cause of ischemic heart disease is coronary atherosclerosis, a condition that narrows the coronary arterial lumen and limits the ability of these arteries to supply blood to the heart. Coronary atherosclerosis can progress clinically without any symptoms . it is not uncommon for the initial manifestation of ischemic heart disease to be an unexpected arrhythmia that may result in sudden death. By far the most common underlying condition of sudden death is coronary atherosclerosis."[5]

KUMAR ABBAS ASTER states " atherosclerosis is an intima based lesion composed of fibrous cap and an atheromatous core. The constituents of the plaque include smooth muscle cells, extracellular matrices, inflammatory cells, lipids, necrotic debris. Atherosclerosis is driven by an interplay of vessel wall injury and inflammation. The multiple risk factors all cause

endothelial cell dysfunction and influence inflammatory cell and smooth muscle cell recruitment and stimulation.

The constitutional (non-modifiable) risk factors for atherosclerosis includes genetic abnormalities, family history, increasing age, male gender and non-constitutional risk factors (modifiable) includes hyperlipidemias, hypertension, cigarette smoking, diabetes mellitus, inflammation.

The clinical importance of atherosclerosis has stimulated enormous interest in understanding the mechanisms that underlie its evolution and complications. The contemporary view of atherogenesis integrates the risk factors and is called ***response to injury*** hypothesis . This model views atherosclerosis as a chronic inflammatory and healing response of the arterial wall to endothelial injury. Lesion progression occurs through the interaction of modified lipoproteins, monocyte derived macrophages, and T lymphocytes with endothelial cells and smooth muscle cells of the arterial wall. According to this scheme , atherosclerosis progresses in the following sequence:

a. Endothelial injury and dysfunction causing increased vascular permeability, increased leucocyte adhesion and thrombosis.

b. Accumulation of lipoproteins, mainly LDL and its oxidised forms in the vessel wall.
c. Monocyte adhesion to endothelium, followed by migration into the intima and transformation into macrophages and foam cells which are lipid laded macrophages.
d. Increased platelet adhesion.
e. Factor release from activated platelets, macrophages and vascular vessel walls, inducing smooth muscle cell recruitment, either from the media or from circulating precursors.
f. Smooth muscle cell proliferation, extracellular matrix production and recruitment of T cells.
g. Lipid accumulation both extracellularly and within cells (macrophages and smooth muscle cells).

Atherosclerotic plaques develop and grow slowly over decades. Stable plaques can produce symptoms related to chronic ischemia by narrowing vessel lumens, whereas unstable plaques can cause dramatic and potentially fatal ischemic complications related to acute plaque rupture, thrombosis or embolization. Stable plaques tends to have dense fibrous cap, minimal lipid

accumulation and little inflammation whereas vulnerable or unstable plaques have thin caps, large lipid cores and relatively dense inflammatory infiltrates.

Atherosclerotic plaques are susceptible to following changes

1. Rupture, ulceration or erosion of the surface of the atheromatous plaque exposes the highly thrombogenic substances and leads to thrombosis which may partially or completely occlude the vessel lumen. If the patient survives the clot may be organized and incorporated into the growing plaque.
2. Hemorrhage into plaque rupture: rupture of the overlying fibrous cap, or of the thin walled vessels in the areas of neovascularisation, can cause intra plaque hemorrhage which is a contained hematoma that may expand the plaque or induce plaque rupture.
3. Atheroembolism: plaque rupture discharge atherosclerotic debris into the blood stream, producing micro emboli.
4. Aneurysm formation: atherosclerosis induced pressure or ischemic atophy of the underlying media, with loss of elastic tissue, causes weakness and potential rupture."[6]

K.S.N.REDDY states that “diseases of the cardiovascular system contributes 45 -50% of sudden death and lists 1)coronary atherosclerosis with coronary thrombus 2)coronary atherosclerosis with hemorrhage in the wall causing occlusion of the lumen 3)coronary artery disease (narrowing and obliteration of the lumen by atherosclerosis 4)coronary artery embolism 5)occlusion of the ostium of coronary arteries associated with atherosclerosis or syphilitic aortitis” [7]

KRISHNAN VIJ states “ The localization of atheroma varies greatly in different areas and frequency is Right main coronary artery (24-46%) and left main coronary artery (0-10%).Types of occlusion are simple atheroma, ulcerative atheroma, subintimal hemorrhage, coronary thrombosis, panarteritis nodosa. Sequalae of coronary occlusion are myocardial infarction, arrhythmias, left ventricular failure/cardiogenic shock, rupture of myocardium, aneurysms, myocardial fibrosis, mural thrombosis and embolism, pericarditis. It is generally agreed that large amounts of almost instantaneous and rapid deaths in adults are caused by the process of coronary atherosclerosis or

by its sequale. The disease might have been present in the individuals for months or years prior to to the traumatic episode"[8]

B UMADETHAN states "Majority of the sudden unexpected deaths are due to cardiovascular causes .therefore sudden natural deaths are divided into cardiac causes and non cardiac causes. eighty percentage of sudden cardiac deaths are due to coronary artery diseases. The common lesion of the coronary artery is atherosclerosis. Atheromatous plaques developed in the intima form the basis of the thrombi which will produce occlusion. The plaques can produce sudden occlusion due to a spontaneous subintimal hemorrhage or ulceration and rupture. A thrombus occluding the main coronary arteries or its branches can cause sudden death"[9]

BARDALE states " sudden death is defined as a death which is not known to be caused by any trauma, poisoning, or violent asphyxial and where death occurs all of a sudden or within 24 hours of the onset terminal symptoms and lists primary cardiac causes as Ischemic heart

disease, cardiomyopathy, myocarditis, valvular diseases, tamponade etc"[10]

PARIKH states " the causes of sudden death are classified as 1.cardiovascular 2.respiratory 3.CNS 4.abdominal 5.endocrine 6.iatrogenic 7.miscellaneous 8.special causes in children9.indeterminate. among the cardiovascular causes coronary artery disease which is due to atherosclerosis, thrombosis, syphilitic aortitis involving the ostia forms the major causes"[11]

P.C.DIKSHIT states "many unexpected deaths will be sudden such as those occuring immediately upon collapse or within minutes and there may be a delay of hours or even days without a diagnosis being clinically evident. In sudden deaths the immediate cause is usually in the cardiovascular system which is around 45- 50% of all causes of sudden death. coronary stenosis with or without thrombosis commonly involves first two cm of the origin of the vessel. The incidence of involvement of vessels are 1. Anterior interventricular (45-64%) 2. Right main coronary (24-46%) 3.left circumflex (3-10%) 4.left

main coronary artery (0-10%) 5.right marginal and posterior interventricular branches are particularly immune" [12]

NAGESHKUMAR RAO states "when a natural death is very rapid , perhaps virtually instantaneous , the cause is invariably cardiovascular. Indeed if a person collapses and is clinically dead when someone nearby runs to assist him , this can be only cardiac arrest as virtually no other mode of death operates so quickly. This type of collapse is the one which may respond best to cardiopulmonary resuscitation. Most common lesion in the cardiovascular system is coronary artery disease (atherosclerosis, thrombosis, syphilis etc)" [13]

MODI states "diseases of the cardiovascular system primarily contributing to sudden death is coronary artery disease including progressive occlusion of coronary artery due to atherosclerosis, recent coronary artery thrombus due to atherosclerosis or embolism due to mural thrombus, periarteritis nodosa, systemic or pulmonary hypertension"[14]

HARRISON states “Atherosclerosis remains the major cause of death and premature disability in developed societies. Moreover current predictions estimate that by the year 2020 cardiovascular diseases, notably atherosclerosis will become the leading global cause of total disease burden, defined as the years subtracted from healthy life by disability or premature death.

When a stenosis reduces cross sectional area by approximately 75% a full range of increases in flow to meet increased myocardial demand is not possible. When the luminal area is reduced to approximately 80% blood flow at rest may be reduced and further minor decreases in the stenotic orifices can reduce coronary flow dramatically and cause myocardial ischemia”[15]

KV KRISHNA DAS states “In all the developed countries where reliable statistics are available ischemic heart disease is one of the most common causes of death and cardiac morbidity in middle age and elderly. Though complete statistics is not available , in India ischemic heart disease accounts for 13.3% - 24% of the total cardiac morbidity in several series. Men suffer 9 times more frequently than premenopausal women, but after

menopause the risk of coronary atherosclerosis rapidly increases to catch up with that of men over a period of several years.

In the Framingham study the male: female ratio in the 35-44 years age group as 6.8:1 but in age group 75-84 the prevalence equaled in both sexes. Despite the lower prevalence once the disease manifests it runs a more aggressive course in females"[16] .

CMDT 2016 states "Coronary heart disease or atherosclerotic CAD is the number one killer worldwide. About 37% of people who experience an acute coronary event, either angina or myocardial infarction, will die of it in the same year.

Over 75% of sudden cardiac deaths have severe coronary artery disease. Sudden death may be a manifestation of coronary disease in upto 20% of the patients and accounts approximately 50% of deaths from coronary disease."[17]

PUTUL MAHANTA states “Death is said to be sudden when a person not known to have any disease, injury or poisoning is either found dead or dies within 24 hours after the onset of terminal illness. Out of all 10% of the deaths reported sudden. Also lists 45% - 50% of the sudden cardiac deaths are due to diseases of cardiovascular system of which coronary artery disease due to atherosclerosis being a major cause.”(18)

PV GUHARAJ states “Among diseases of the cardiovascular system, occlusive coronary heart disease is the single important cause of sudden death. Thrombosis secondary to atherosclerosis accounts for partial or complete occlusion in 75% of the cases. The maximum frequency of atheromatous stenosis is seen in the first part of the left coronary artery usually within the first two centimeters of its origin”(19)

VV PILLAY states “diseases of the cardiovascular system account for about 45 percent of the sudden deaths, diseases of the respiratory system 25 percent, diseases of the nervous system about 20 percent and the rest occur due to diseases of other organs.

The most common cardiac causes appear to be 1.coronary artery disease with myocardial infarction 2.non-atherosclerotic coronary artery disease, cardiomyopathy, myocarditis etc"[20]

ANIL AGGRAWAL states "salient features of sudden and unexpected death is generally more surprisingly unexpected than sudden. Incidence is 10 percent of all deaths. No age is exempt. Diseases of the cardiovascular system is the leading cause of sudden death with incidence around 45 percent to 50 percent. About 80 percent of cardiovascular deaths are due to coronary artery disease. Incidence of atherosclerosis in right main coronary artery is 24 percent to 46 percent and incidence of atherosclerosis in left main coronary artery is 0 percent to 10 percent"[21]

J.B.MUKHERJEE states "An apparently healthy individual of ay age when dies suddenly and unexpectedly, without any predisposition or even in case of natural death under suspicious state, a situation of foul play can arise. This is important especially in cases of poisoning or where the deceases is said to have been quarrelling with somebody else just before death, when

medicolegal investigation and autopsy should be thorough, to avoid undue murder charge being bought against an innocent person.

It is quite possible for a person to lead an apparently normal healthy life while suffering from a disease, existence of which may even be unknown to him. Diseases of the cardiovascular system contributes 45% to 50% of such cases and in those cases narrowing of the coronary vessels can be due to atherosclerosis, thrombosis, spasm. Coronary hyperplasia with haemorrhage in the wall causing narrowing or even complete occlusion of the lumen of the artery.

Coronary occlusion due to atheroma with resultant cardiac ischemia is the most common cause of sudden death. This may be complicated by thrombosis to result in rupture of the heart at the infarct area in the course of few days.

Lately the evidence of coronary disease has greatly increased. Mostly affecting middle aged and elderly, recently it also more frequently

affects younger individuals. It is usual for death to occur from simple coronary occlusion due to atheroma, attack being precipitated by factors like physical exertion or psychological stress which increases the demand of blood for the heart for its normal functioning. Hence stress or strain on climbing uphill, simply working a hand pump, some sort of psychological stress resulting in severe emotional disturbance can precipitate deaths in such cases. When the deceases at the time of death if he is employed , a claim for compensation may rightly be instituted.

There will be no sign of infarction if death takes place with dramatic suddenness. Sudden death more frequently occurs in younger individuals as they have very less developed collateral circulation"[22]

RESULTS AND ANALYSIS

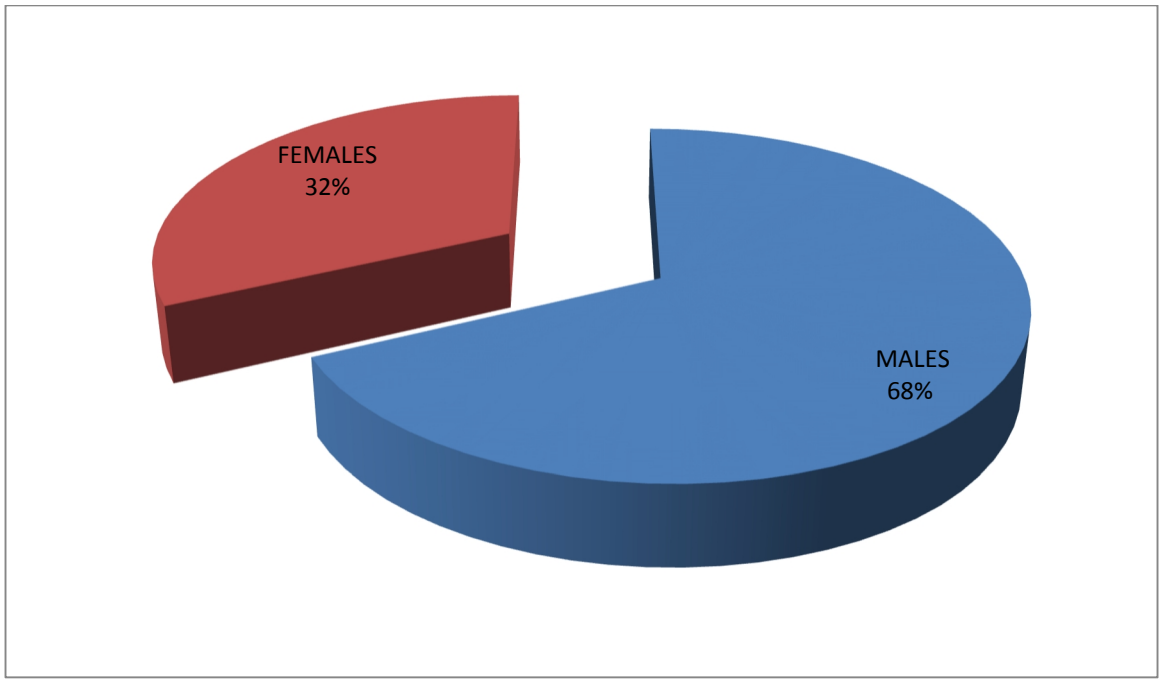
After dissecting the heart out and determining the degree of atherosclerotic lesions in their right coronary artery and left coronary artery the data is entered into master chart.

As discussed in the review of literature various textbooks and studies shows that atherosclerosis in coronary vasculature starts at an early age and remain asymptomatic until manifestation occurs at late stage which in turn may cause serious disability or even deaths in certain cases.

The samples were taken from bodies subjected to autopsy in mortuary, Department of Forensic Medicine, Tirunelveli Medical College, Tirunelveli with known age at death from records from 21 years to 40 years. For the purpose of analyzing the data the subjects are divided into two groups as males and females and each further grouped into 4 groups by age as 21 years - 25 years, 26 years – 30 years, 31 years - 35 years, 36 years – 40 years of age.

Interpretation and analysis of the results obtained in my study are as follows:

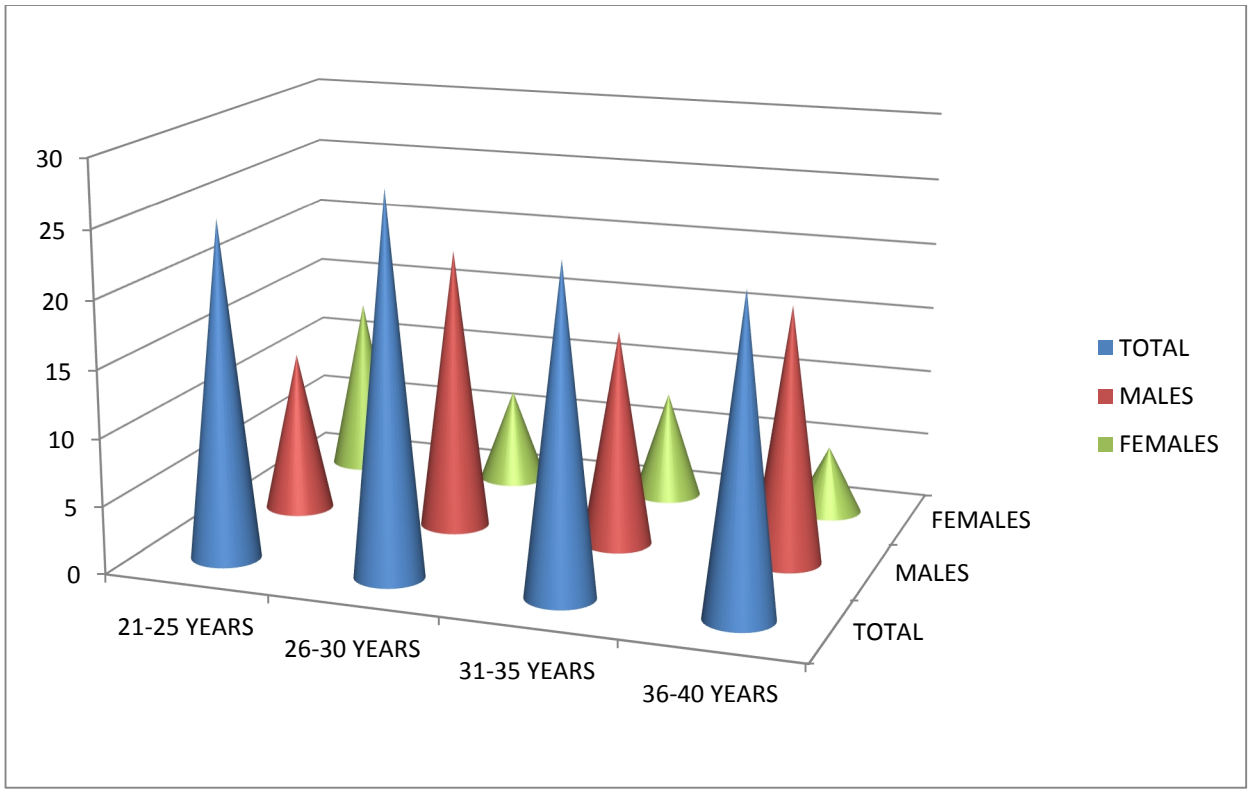
A total sample size of 100 cases were obtained from bodies subjected to autopsy in mortuary, Department of Forensic Medicine, Tirunelveli Medical College, Tirunelveli with known age at death from records from 21 years to 40 years. Of the 100 samples obtained there were 68 males(hence 68% of total cases) and 32 females (hence 32% of total cases) .



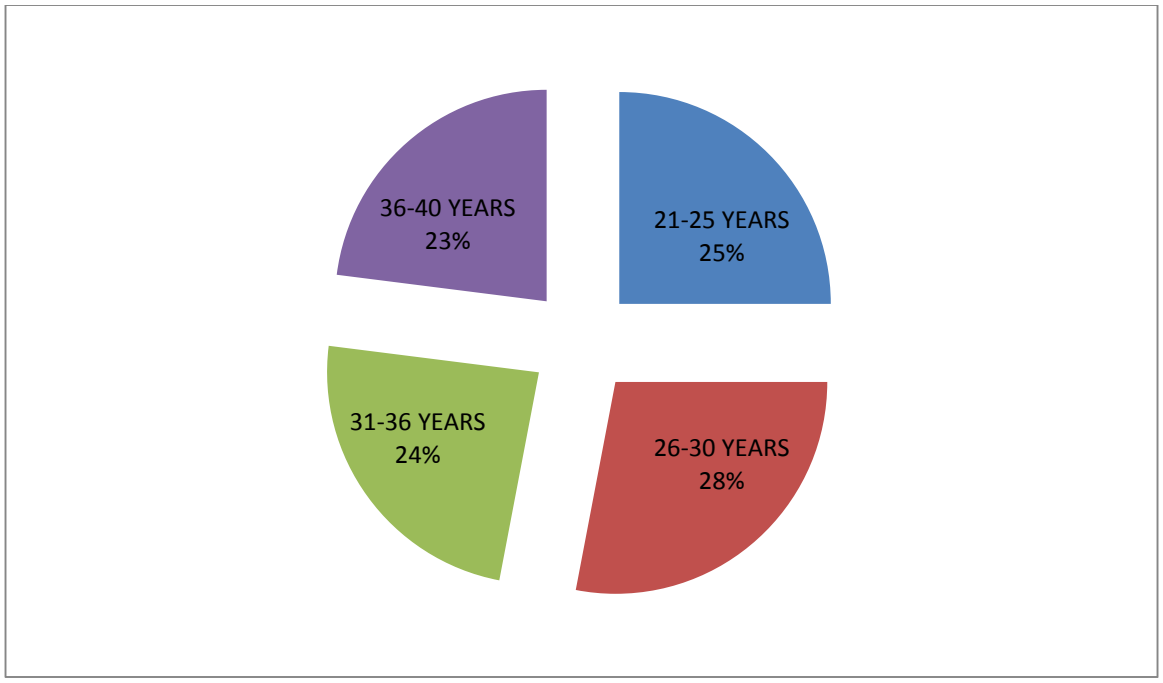
TOTAL CASES SEX DISTRIBUTION

The samples are divided according to age groups 21-25, 26-30, 31-36, 36-40 years, the total samples yielded a total of 25 cases in age group 21-25 years out of which 12 cases were males and 13 cases were females, total of 28 cases in age group 26-30 years out of which 21 cases were males and 7 cases were females, total of 24 cases in age group 31-35 years out of which 16 cases were males and 8 cases were females, total of 23 cases in age group 36-40 years out of which 19 cases were males and 4 cases were females.

AGE GROUP YEARS	**TOTAL NUMBER OF CASES**	**NUMBER OF MALES**	**NUMBER OF FEMALES**
21-25	25	12	13
26-30	28	21	7
31-35	24	16	8
36-40	23	19	4



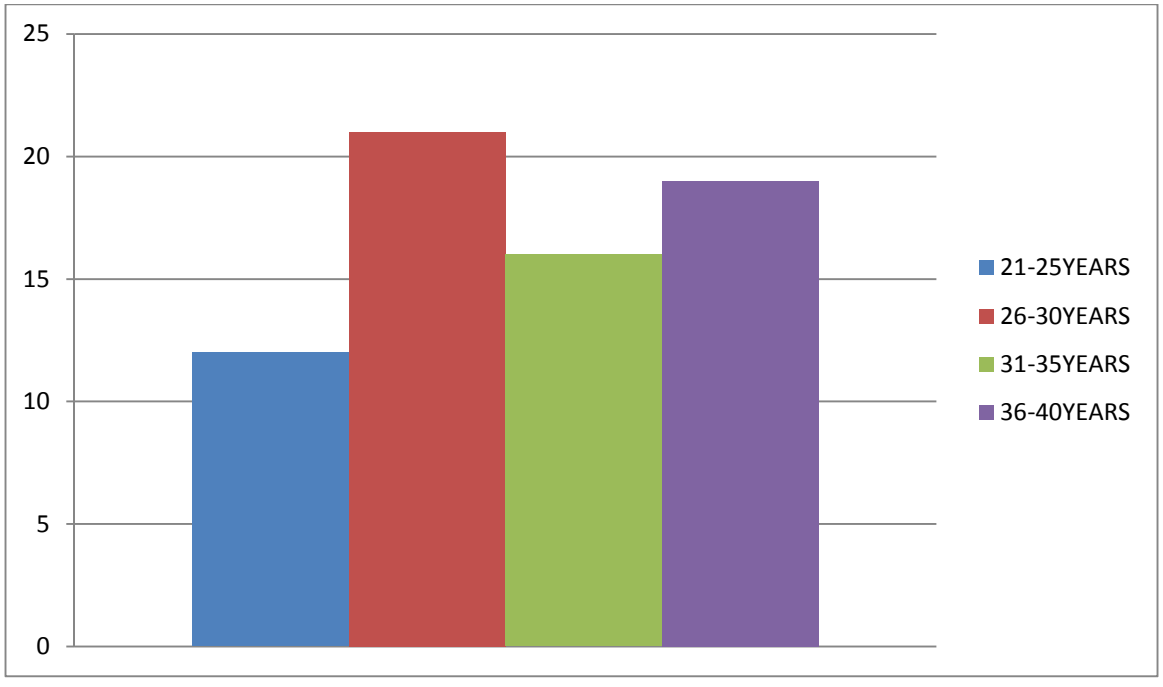
DISTRIBUTION OF CASES IN AGE GROUPS



Among males who constitute 68% of the total cases , on subdividing them according to age groups, 12 males belongs to age group 21 – 25 years and contributed to 17.6% of total male samples (12 males out of 68 males), 21 males belongs to age group 26 – 30 years and contributed to 30.8% of total male samples (21 males out of 68 males) , 16 males belongs to age group 31 – 35 years and contributed to 23.5% of total male samples(16 males out of 68 males) and 19 males belongs to age group 36 – 40 years and contributed to 27.9% of total male samples (19 males out of 68 males).

AGE GROUP YEARS	NUMBER OF MALES	PERCENTAGE OF MALES(OUT OF 68 TOTAL MALES)
21-25	12	17.6%
26-30	21	30.8%
31-35	16	23.5%
36-40	19	27.9%

AGE DISTRIBUTION OF MALE CASES

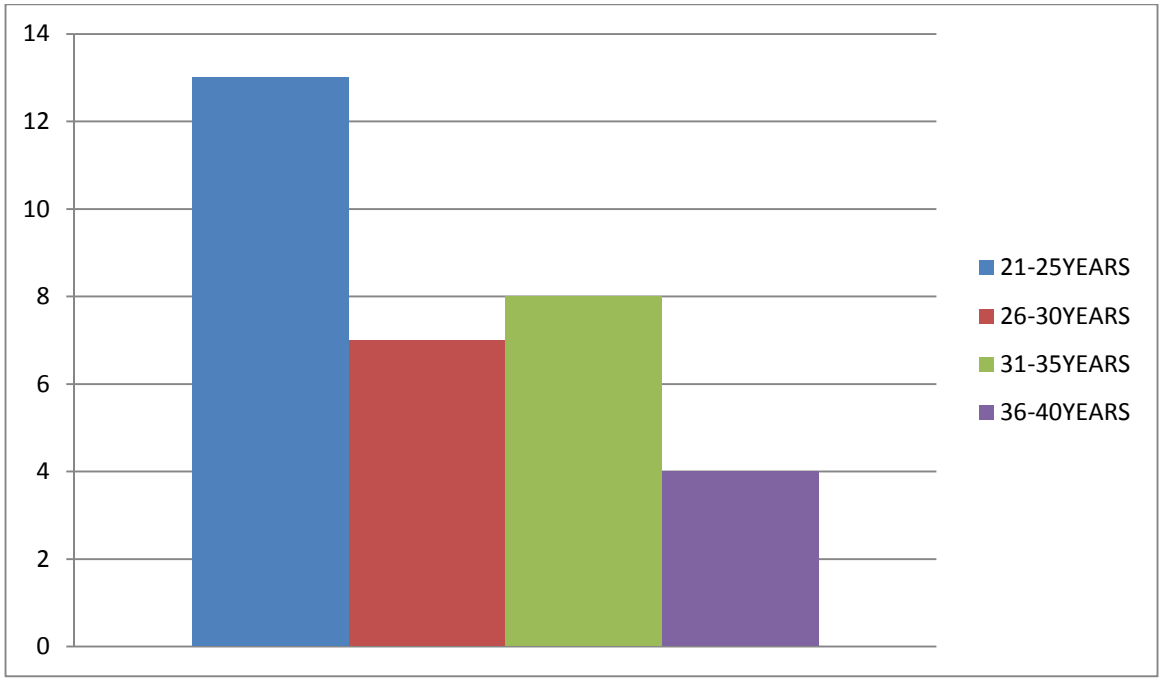


Among females who constitute 32% of the total cases , on subdividing them according to age groups, 13 females belongs to age group 21 – 25 years and contributed to 40.6% of total female samples (13 females out of 32 females),

7 females belongs to age group 26 – 30 years and contributed to 21.8% of total female samples (7 females out of 32 females) , 8 females belongs to age group 31 – 35 years and contributed to 25% of total female samples(8 females out of 32 females) and 4 females belongs to age group 36 – 40 years and contributed to 12.5% of total female samples (4 females out of 32 females).

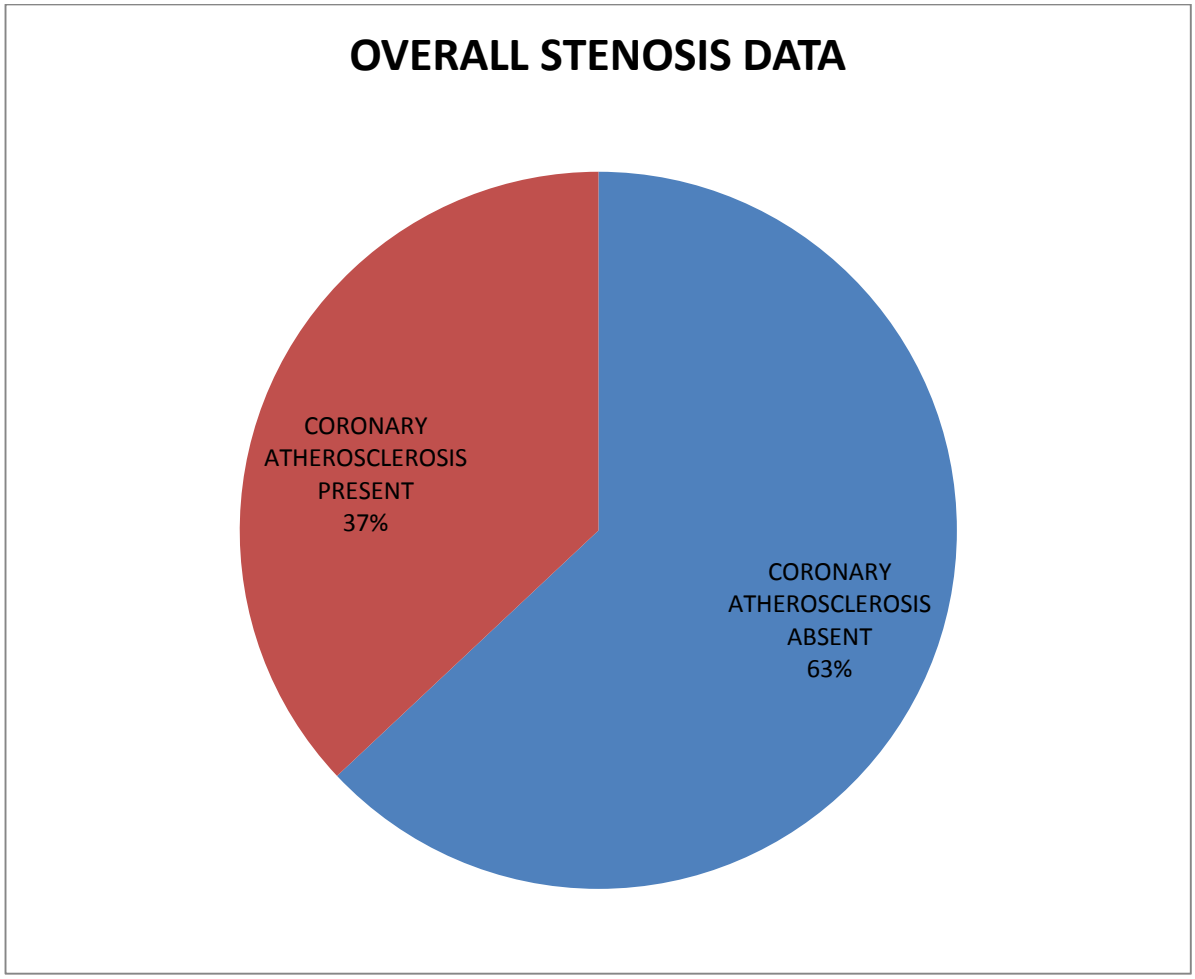
AGE GROUP YEARS	NUMBER OF FEMALES	PERCENTAGE OF FEMALES(OUT OF 32 TOTAL FEMALES
21-25	13	40.6%
26-30	7	21.8%
31-35	8	25.0%
36-40	4	12.5%

AGE DISTRIBUTION OF FEMALE CASES



Of the data collected from the overall 100 samples, in a total of 63 cases no atherosclerotic stenosis was noted in the right and left coronary arteries. The

right and left coronary arteries in 37 cases showed presence of atherosclerotic lesions of varying grades.



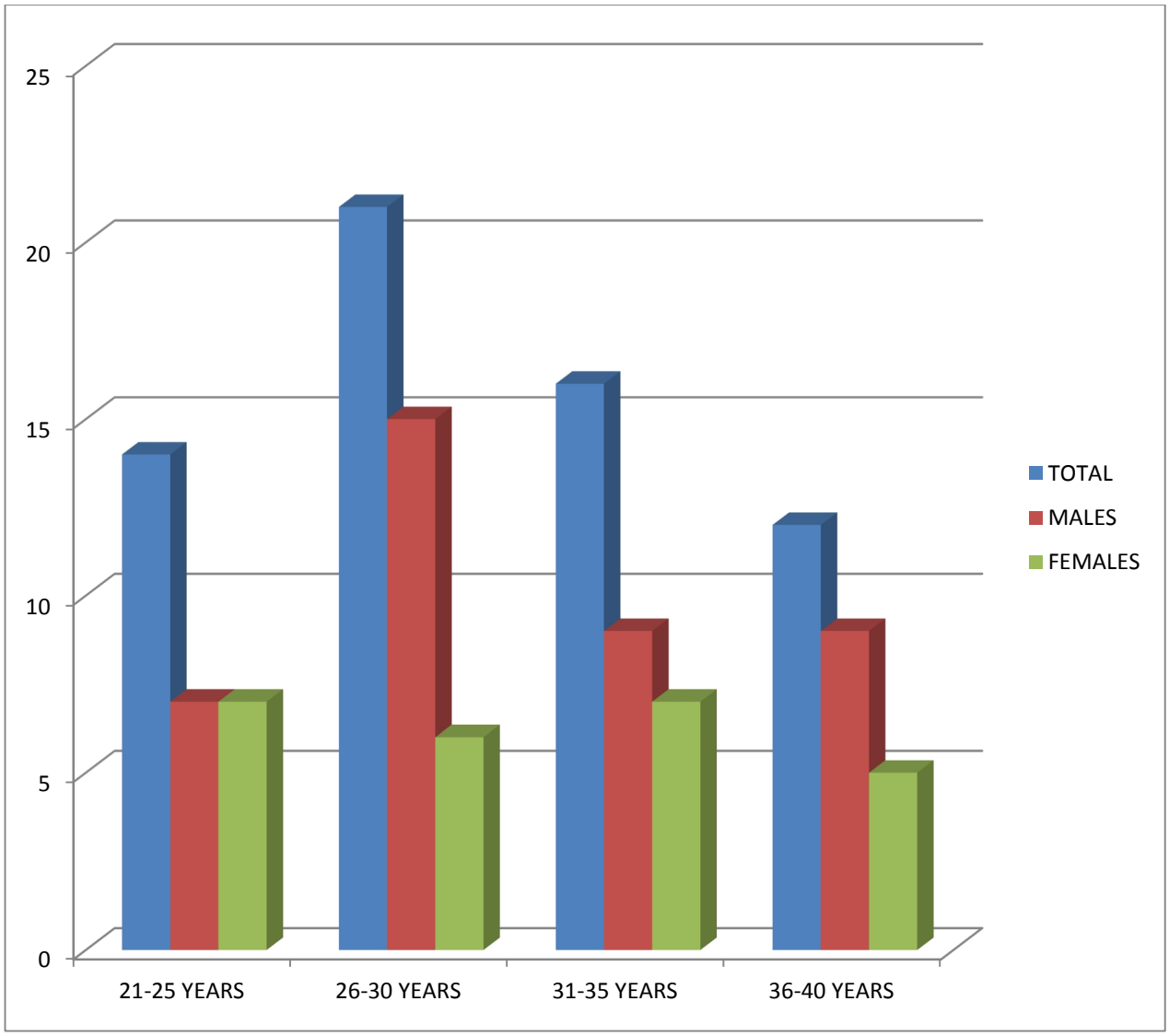
Of the 63 cases that showed normal features, 40 cases are males and 23 cases are females.

Among male cases that showed no atherosclerotic changes, 7 cases are in age group 21-25 years, 15 cases in age group 26-30 years, 9 cases in age group 31-35 years, 9 cases in age group 36-40 years.

Among the female cases that showed no atherosclerotic changes, 7 cases are in age group 21-25 years, 6 cases are in age group 26-30 years, 7 cases are in age group 31-35 years, 3 cases are in age group 36-40 years.

DISTRIBUTION OF NORMAL CASES

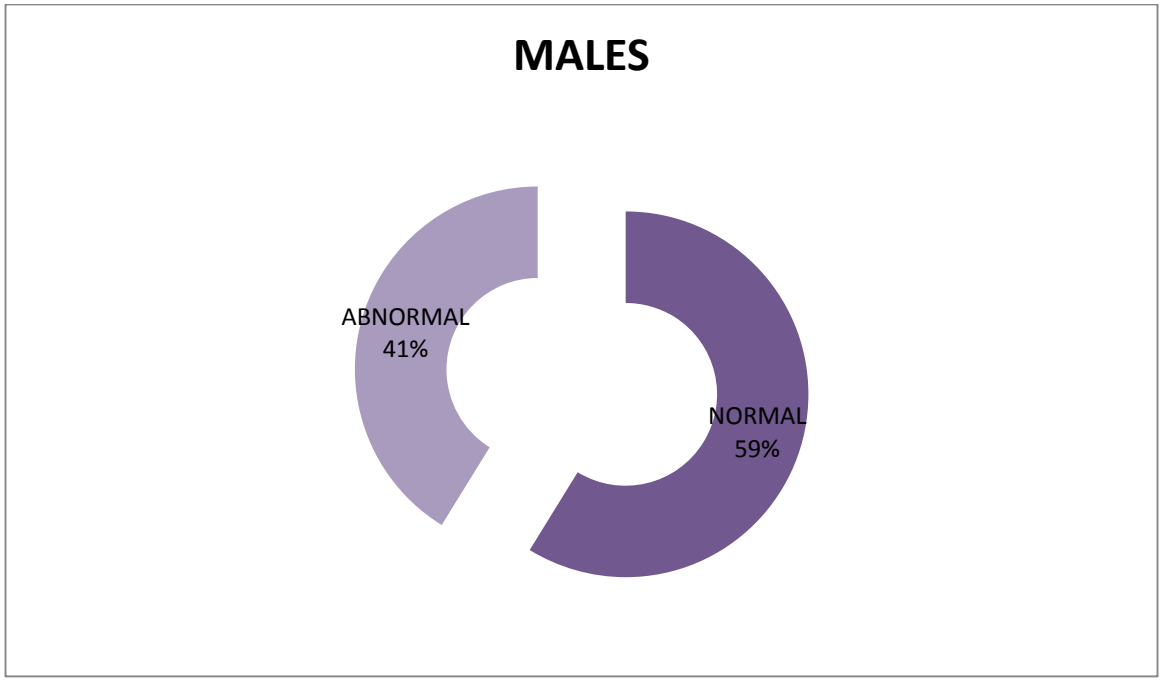
AGE GROUP YEARS	NUMBER OF MALES	NUMBER OF FEMALES	TOTAL
21-25	7	7	14
26-30	15	6	21
31-35	9	7	16
36-40	9	3	12
TOTAL	40	23	63

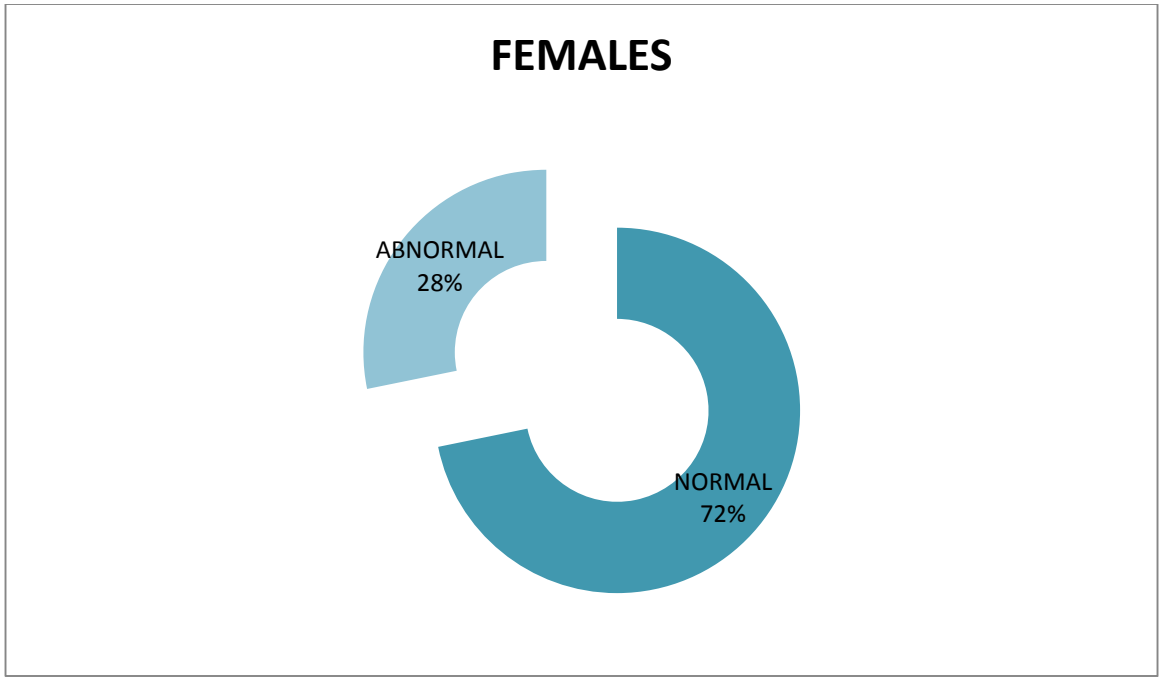


DISTRIBUTION OF NORMAL CASES

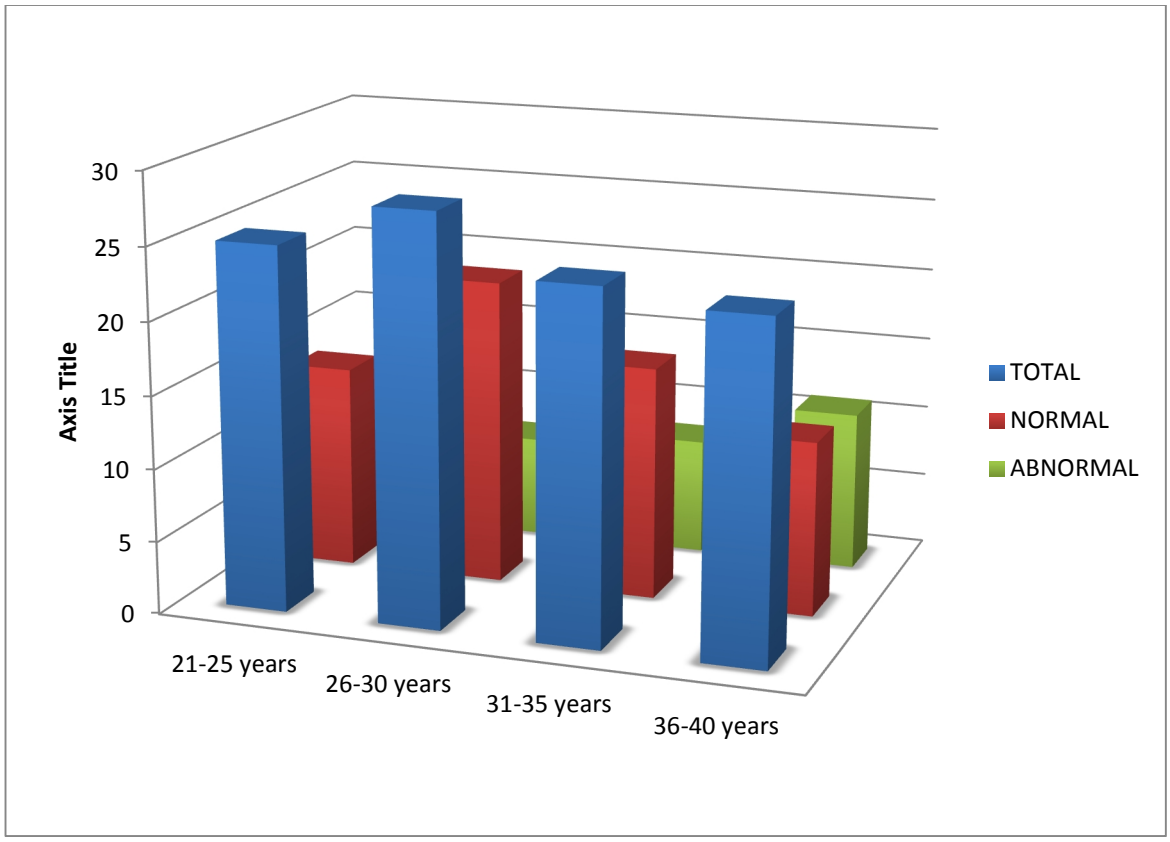
Overall out of 68 males in the total sample, 40 males (58.8%) showed no atherosclerotic lesions of the coronary arteries and 28 males (41.2%) showed varying grades of atherosclerotic lesions. Out of the 32 females in the total sample 23 females (71.8%) showed no atherosclerotic lesions of the coronary

arteries and 9 females (28.2%) showed atherosclerotic lesions of varying grades in the coronary arteries.





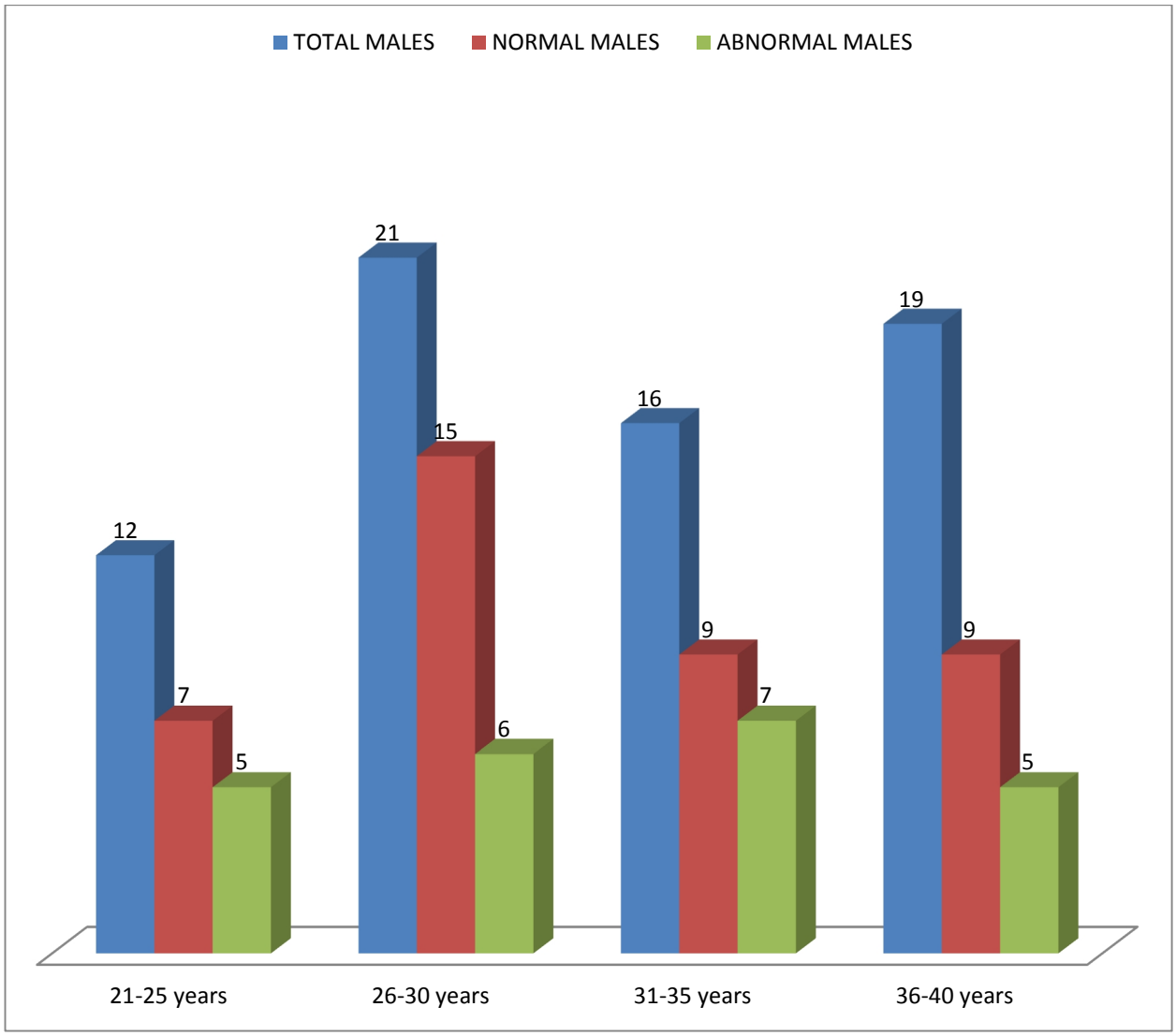
Regrouping the normal cases according to age groups 21-25, 26-30, 31-35, 36-40 years gives that out of 25 cases (12 males +13 females) in age group 21-25 years, 14 cases (56%) showed no changes in the coronary arteries and 11 cases (44%) showed atherosclerotic changes in coronary arteries. Out of 28 cases (21 males +7 females) in age group 26-30 years, 21 cases (75%) showed no changes in the coronary arteries and 7 cases (25%) showed atherosclerotic changes in coronary arteries. Out of 24 cases (16 males + 8 females) in age group 31-35 years, 16 cases (66.7%) showed no changes in the coronary arteries and 8 cases (33.3%) showed atherosclerotic changes in coronary arteries. Out of 23 cases (19 males + 4 females) in age group 36-40 years, 12 cases (52.2%) showed no changes in the coronary arteries and 11 cases (47.8%) showed atherosclerotic changes in coronary arteries.



OVERALL AGEWISE PREVALENCE

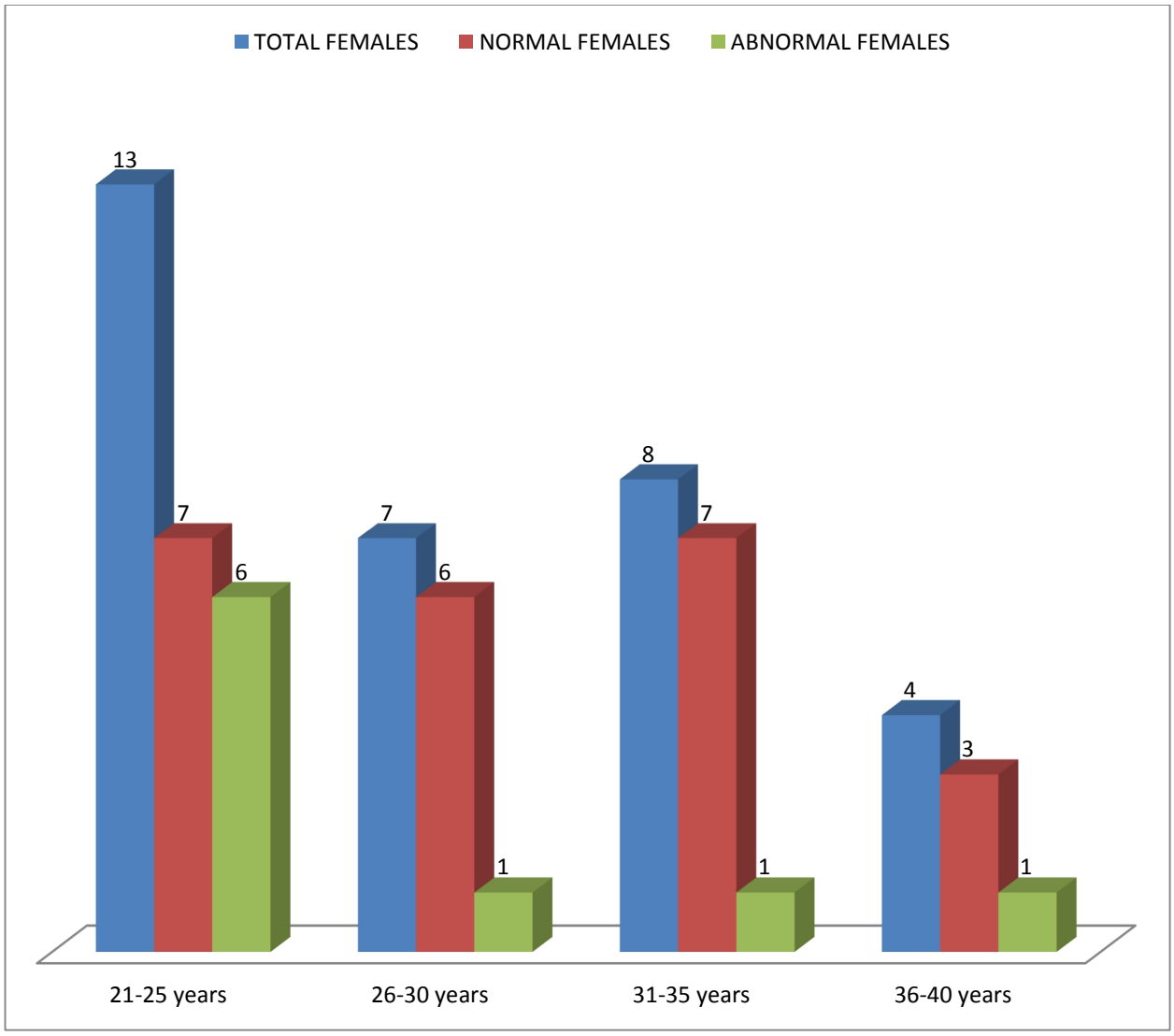
Regrouping the normal cases according to male sex in age groups 21-25, 26-30, 31-35, 36-40 years gives that out of 12 males in age group 21-25 years, 7 cases (58.3%) showed no changes in the coronary arteries and 5 cases (41.7%) showed atherosclerotic changes in coronary arteries. Out of 21 males in age group 26-30 years, 15 cases (71.4%) showed no changes in the coronary arteries and 6 cases (28.6%) showed atherosclerotic changes in coronary arteries. Out of 16 males in age group 31-35 years, 9 cases (56.3%)

showed no changes in the coronary arteries and 7 cases (43.7%) showed atherosclerotic changes in coronary arteries. Out of 19 males in age group 36-40 years, 9 cases (47.4%) showed no changes in the coronary arteries and 10 cases (52.6%) showed atherosclerotic changes in coronary arteries.



OVERALL PREVALENCE MALES

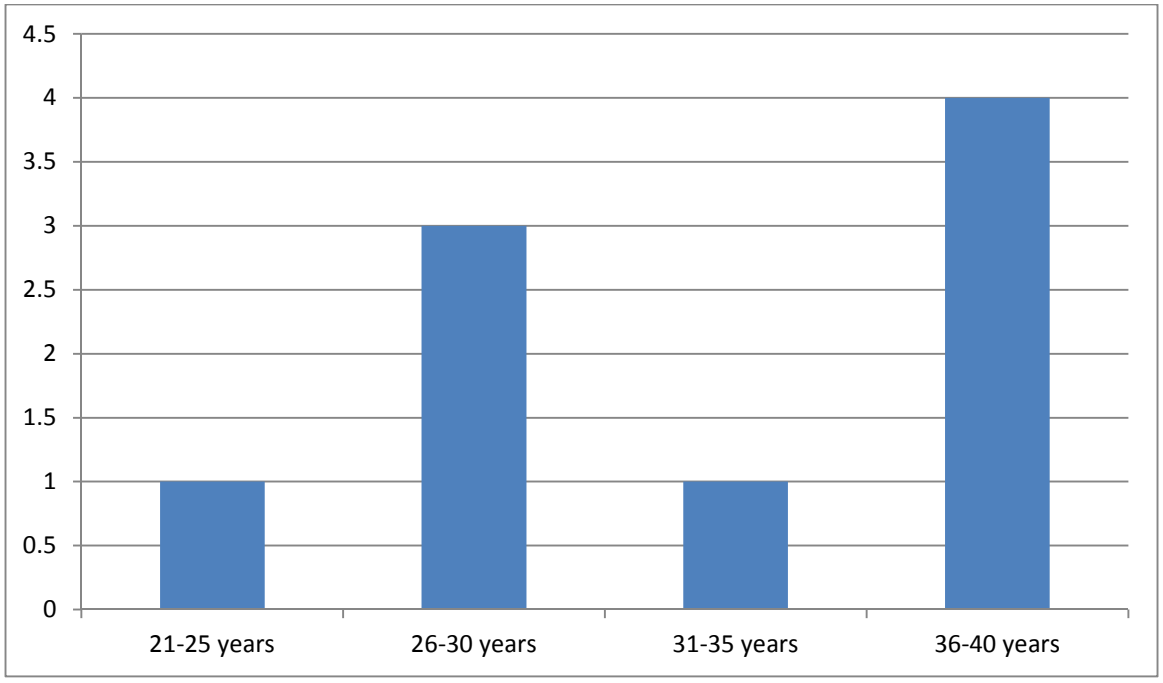
Regrouping the normal cases according to female sex in age groups 21-25, 26-30, 31-35, 36-40 years gives that out of 13 females in age group 21-25 years, 7 cases (53.8%) showed no changes in the coronary arteries and 6 cases (46.2%) showed atherosclerotic changes in coronary arteries. Out of 7 females in age group 26-30 years, 6 cases (85.7%) showed no changes in the coronary arteries and 1 case (14.3%) showed atherosclerotic changes in coronary arteries. Out of 8 females in age group 31-35 years, 7 cases (87.5%) showed no changes in the coronary arteries and 1 case (12.5%) showed atherosclerotic changes in coronary arteries. Out of 4 females in age group 36-40 years, 3 cases (75%) showed no changes in the coronary arteries and 1 case (25%) showed atherosclerotic changes in coronary arteries.



OVERALL PREVALENCE FEMALES

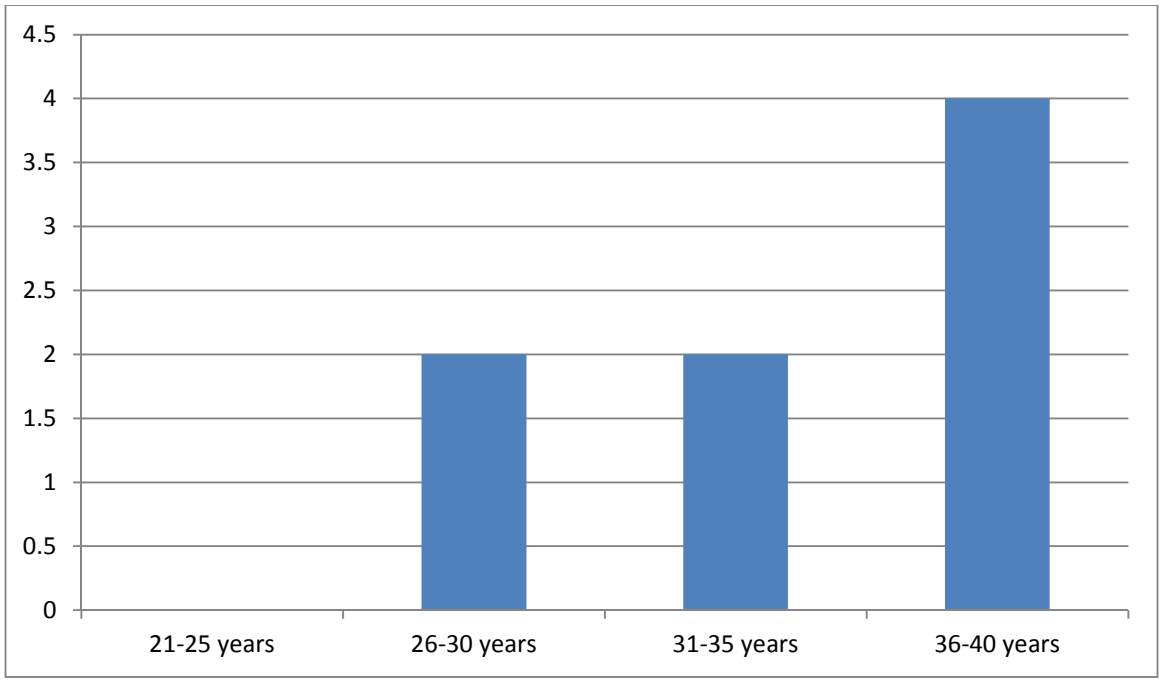
On analyzing the frequency and distribution of grade 1 atherosclerotic lesions, it is found that among the 37 cases with varying degree of atherosclerotic lesions, in right coronary artery among age group 21-25 years 1 case has grade 1 lesion, 3 cases had grade 1 lesions in age group 26-30 years, 1 case

had grade 1 lesions in age group 31-35 years, 4 cases had grade 1 lesions in age group 36-40 years.



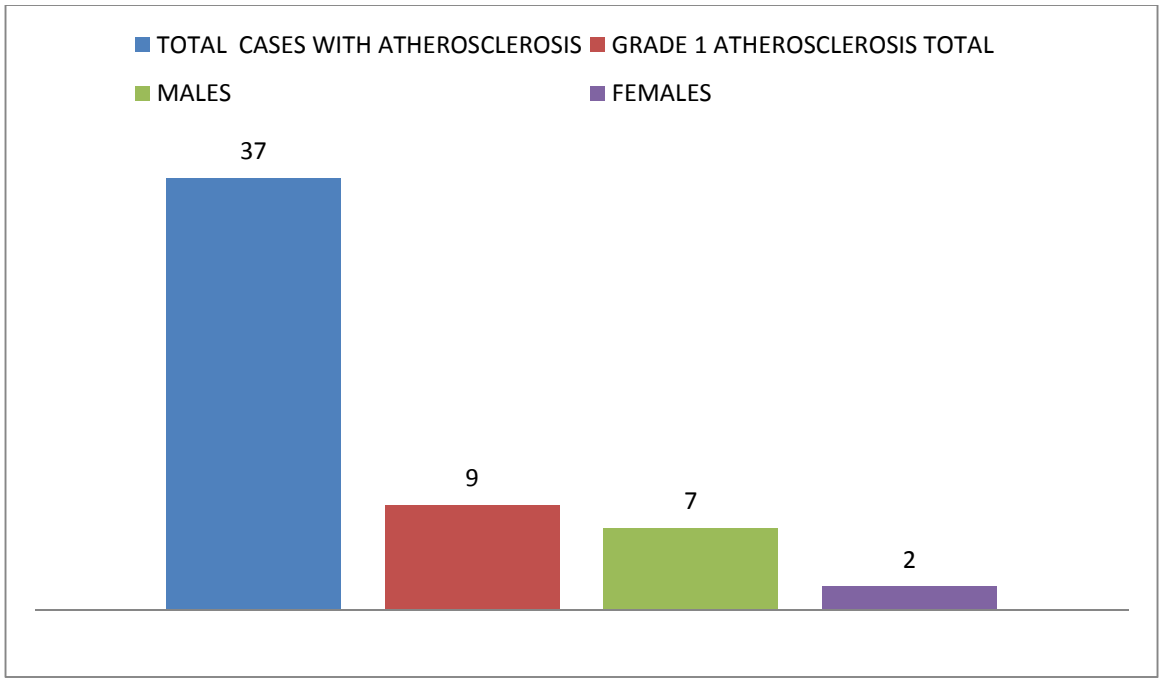
GRADE 1 ATHEROSCLEROSIS DISTRIBUTION AGEWISE- RCA

In left coronary artery among age group 21-25 years 0 case has grade 1 lesion, 2 cases had grade 1 lesions in age group 26-30 years, 2 cases had grade 1 lesions in age group 31-35 years, 4 cases had grade 1 lesions in age group 36-40 years.

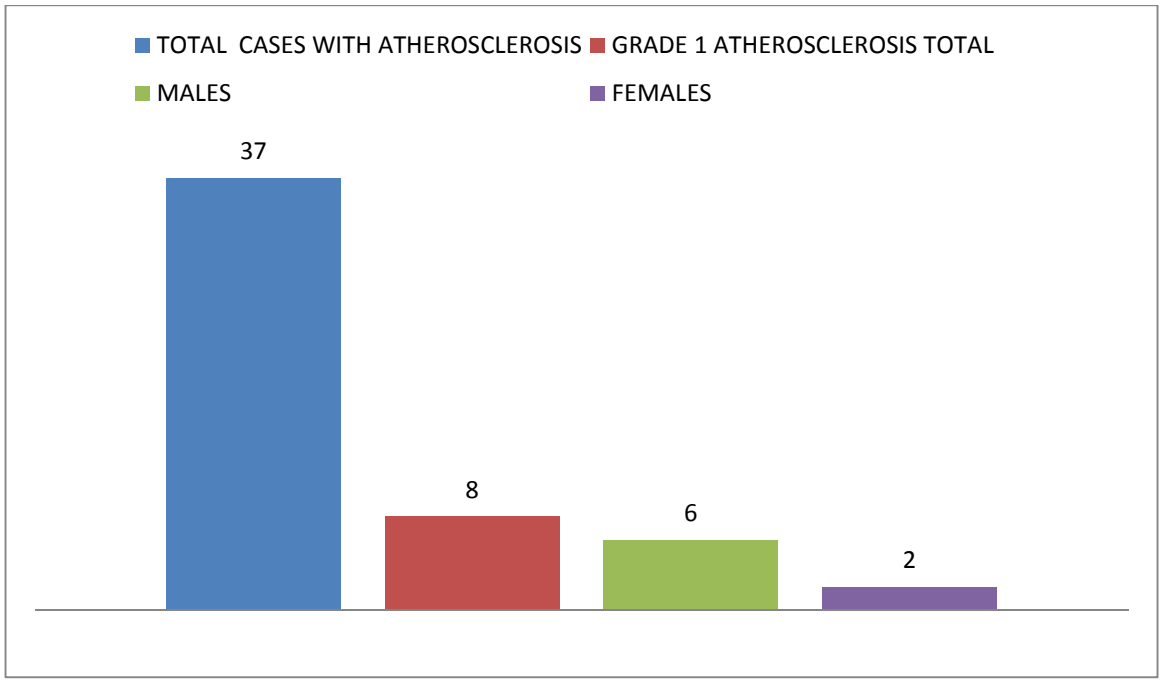


GRADE 1 ATHEROSCLEROSIS DISTRIBUTION AGEWISE- LCA

overall grade 1 lesions are seen in right coronary artery in 9 cases and in left coronary it is seen in 8 cases. Of the 9 cases in right coronary artery 7 cases are males and 2 cases are females. Of the 8 cases of lesions in left coronary artery 6 cases are males and 2 cases are females.

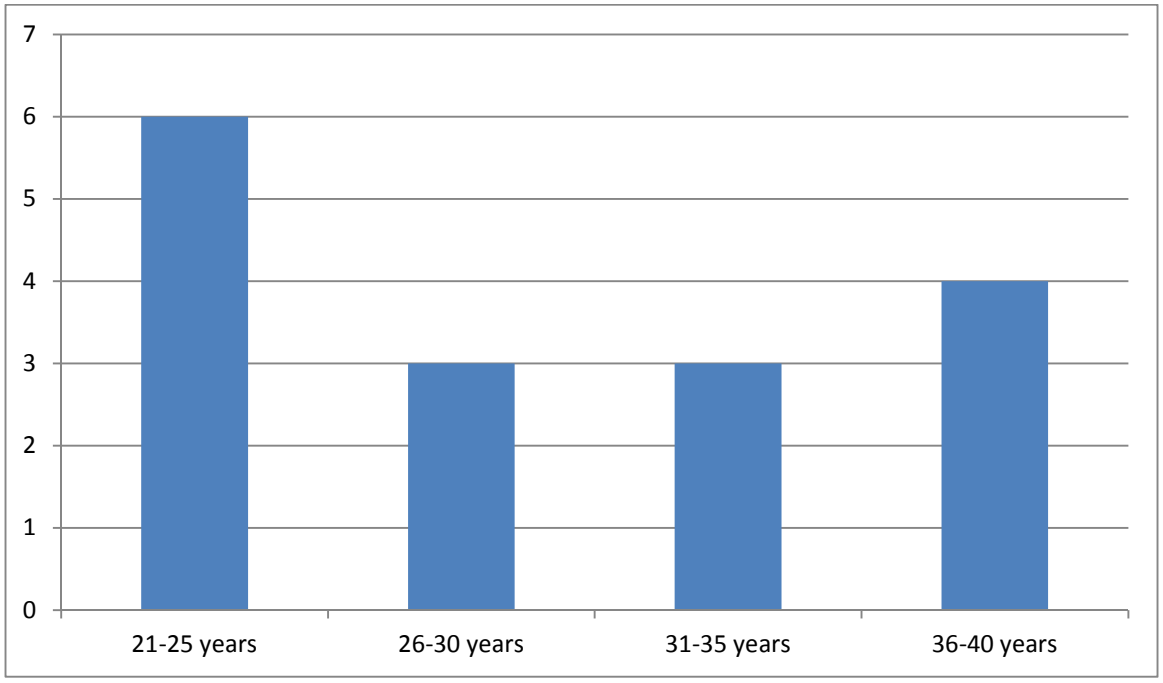


GRADE 1 ATHEROSCLEROSIS SEXWISE DISTRIBUTION- RCA



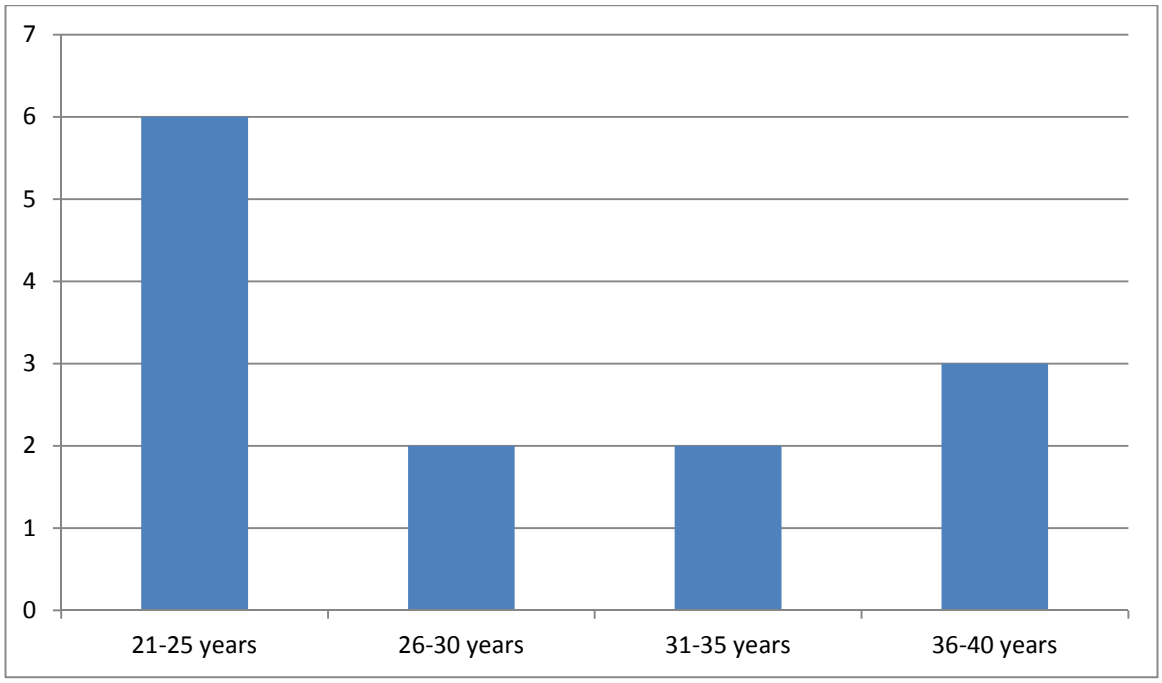
GRADE 1 ATHEROSCLEROSIS SEXWISE DISTRIBUTION- LCA

On analyzing the frequency and distribution of grade 2 atherosclerotic lesions, it is found that among the 37 cases with varying degree of atherosclerotic lesions, in right coronary artery among age group 21-25 years 6 cases has grade 2 lesion, 3 cases had grade 2 lesions in age group 26-30 years, 3 cases had grade 2 lesions in age group 31-35 years, 2 cases had grade 2 lesions in age group 36-40 years.



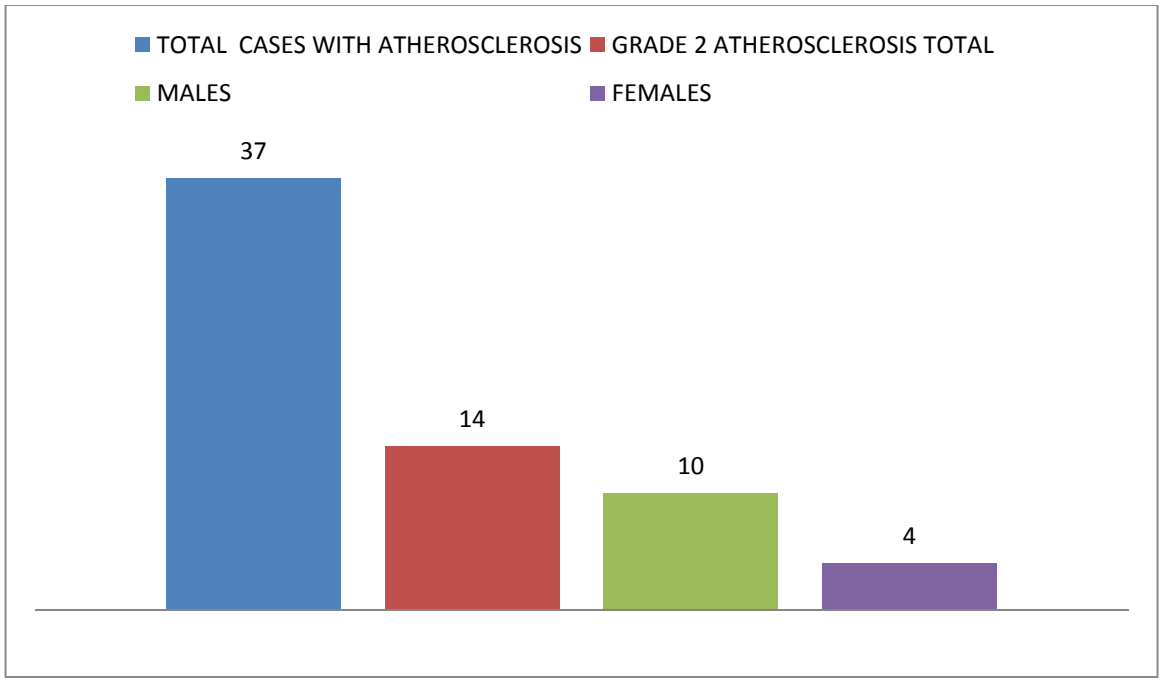
GRADE 2 ATHEROSCLEROSIS DISTRIBUTION AGEWISE- RCA

In left coronary artery among age group 21-25 years 6 case has grade 2 lesion, 2 cases had grade 2 lesions in age group 26-30 years, 2 cases had grade 2 lesions in age group 31-35 years, 3 cases had grade 2 lesions in age group 36-40 years.

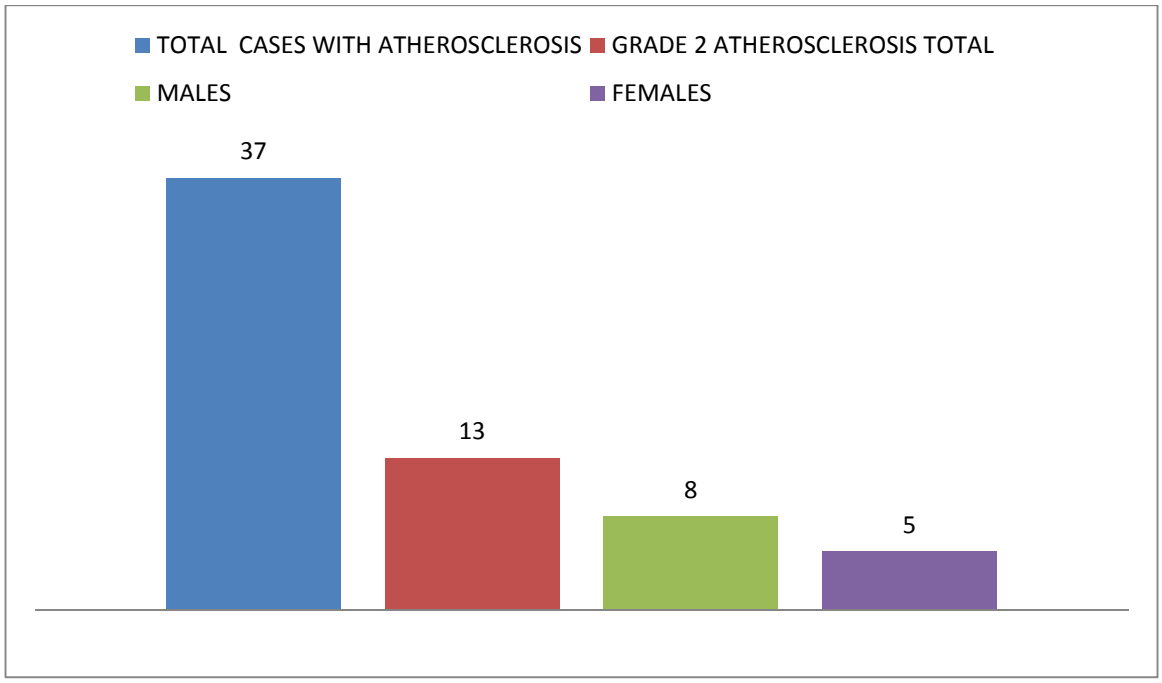


GRADE 2 ATHEROSCLEROSIS DISTRIBUTION AGEWISE- LCA

Overall grade 2 lesions are seen in right coronary artery in 14 cases and in left coronary it is seen in 13 cases. Of the 9 cases in right coronary artery 10 cases are males and 4 cases are females. Of the 13 cases of lesions in left coronary artery 8 cases are males and 5 cases are females.

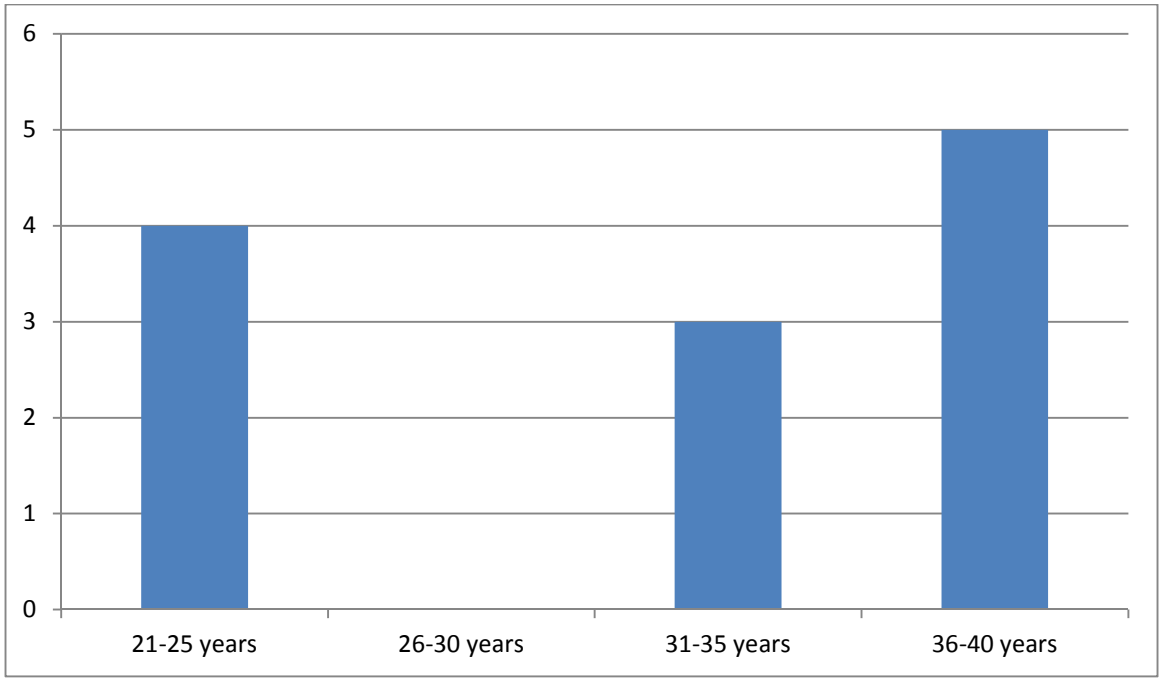


GRADE 2 ATHEROSCLEROSIS SEXWISE DISTRIBUTION- RCA



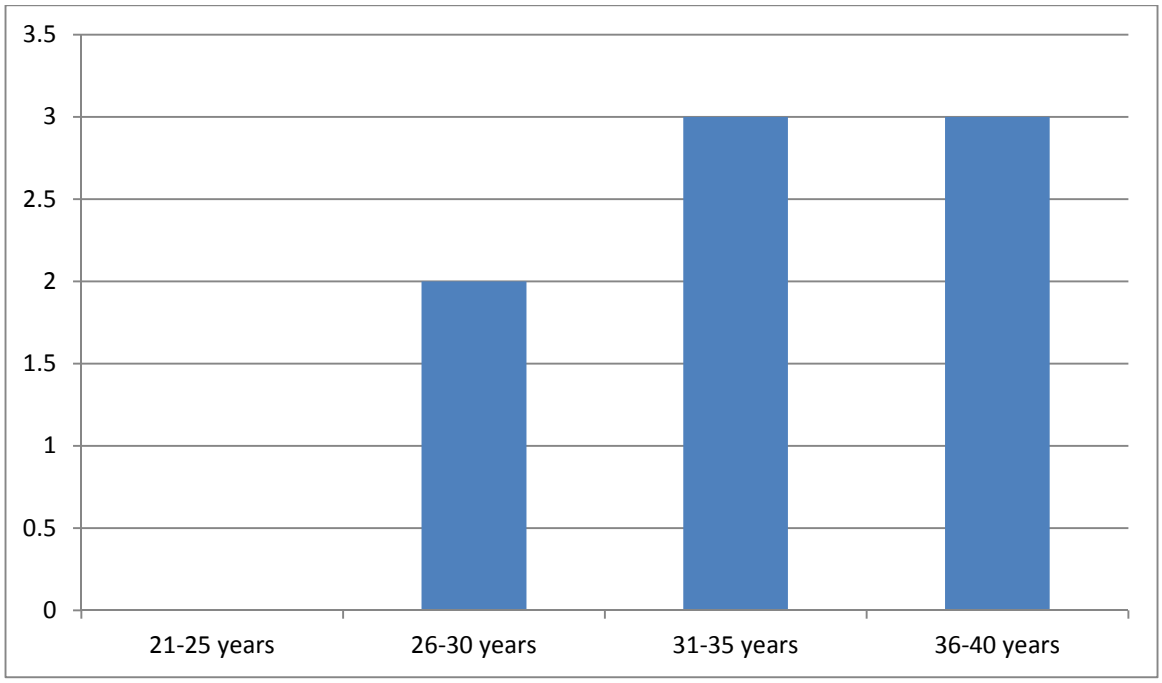
GRADE 2 ATHEROSCLEROSIS SEXWISE DISTRIBUTION- LCA

On analyzing the frequency and distribution of grade 3 atherosclerotic lesions, it is found that among the 37 cases with varying degree of atherosclerotic lesions, in right coronary artery among age group 21-25 years 4 cases has grade 3 lesion, 0 case had grade 3 lesions in age group 26-30 years, 3 cases had grade 3 lesions in age group 31-35 years, 5 cases had grade 3 lesions in age group 36-40 years.



GRADE 3 ATHEROSCLEROSIS DISTRIBUTION AGEWISE- RCA

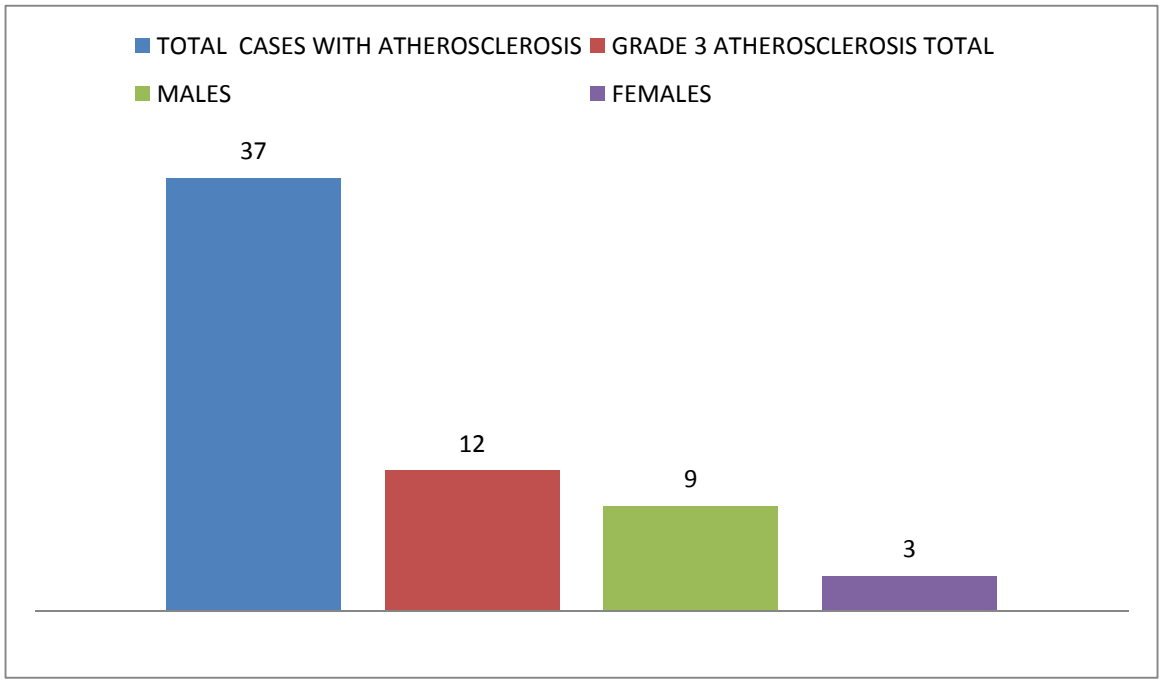
In left coronary artery among age group 21-25 years 0 case has grade 3 lesion, 2 cases had grade 3 lesions in age group 26-30 years, 3 cases had grade 3 lesions in age group 31-35 years, 3 cases had grade 3 lesions in age group 36-40 years.



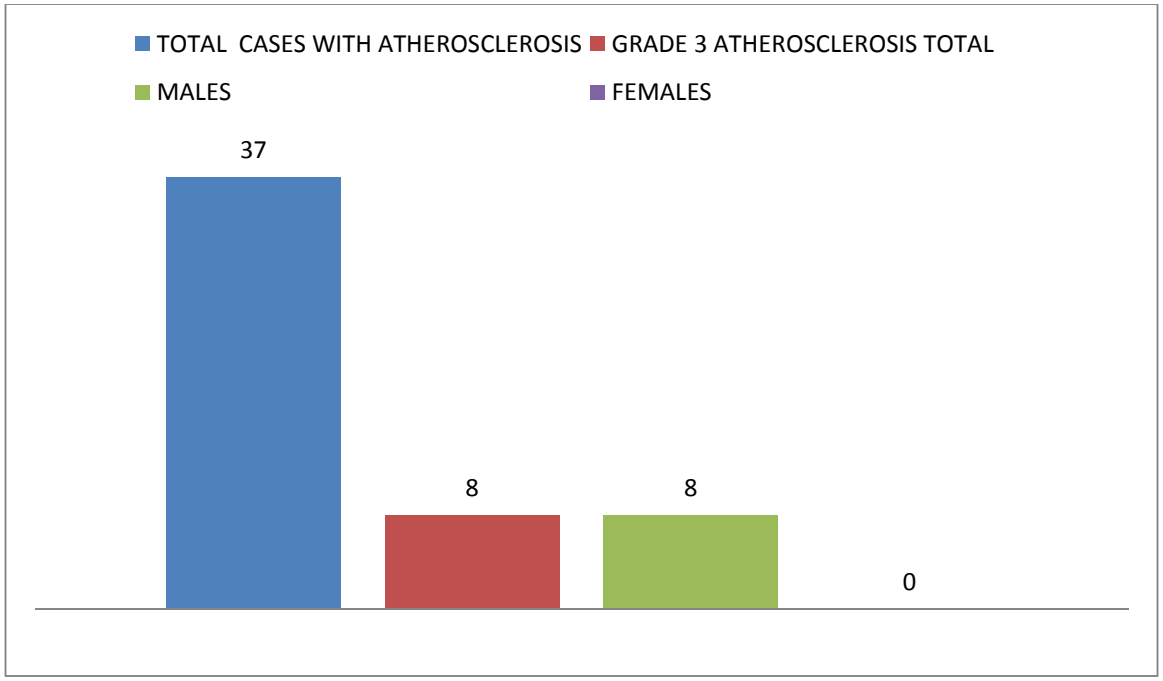
GRADE 3 ATHEROSCLEROSIS DISTRIBUTION AGEWISE- LCA

Overall grade 3 lesions are seen in right coronary artery in 12 cases and in left coronary it is seen in 8 cases. Of the 12 cases in right coronary artery 9 cases are males and 3 cases are females. Of the 8 cases of lesions in left coronary

artery 8 cases are males and 0 cases are females.



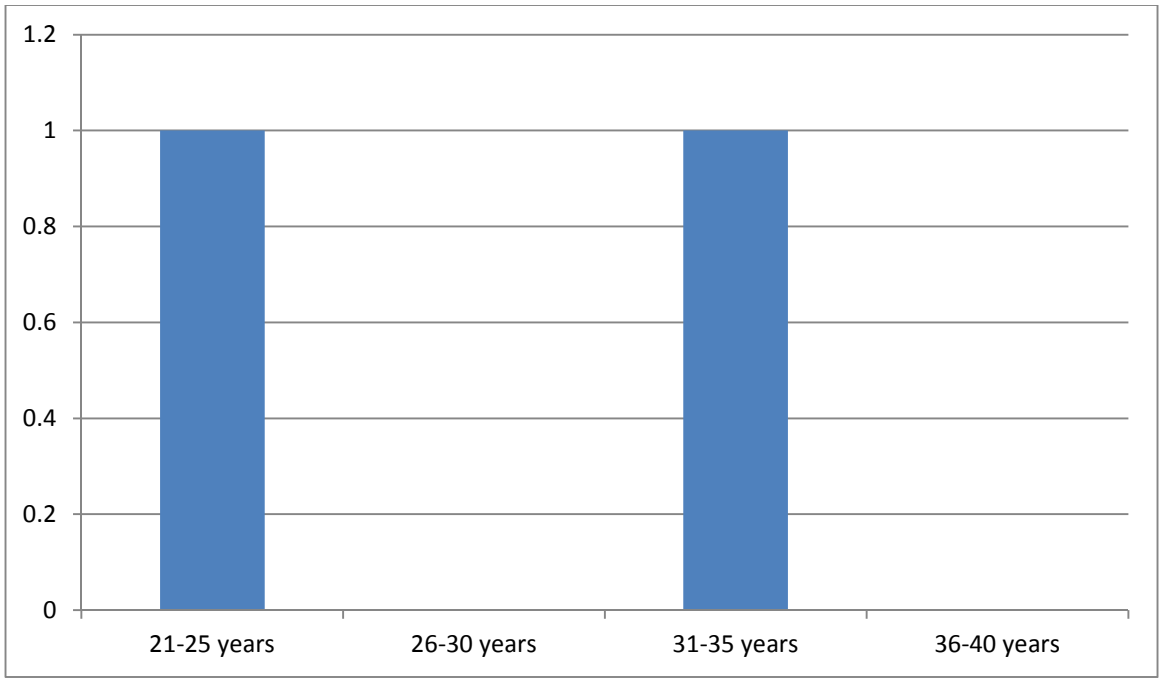
GRADE 3 ATHEROSCLEROSIS SEXWISE DISTRIBUTION- RCA



GRADE 3 ATHEROSCLEROSIS SEXWISE DISTRIBUTION- LCA

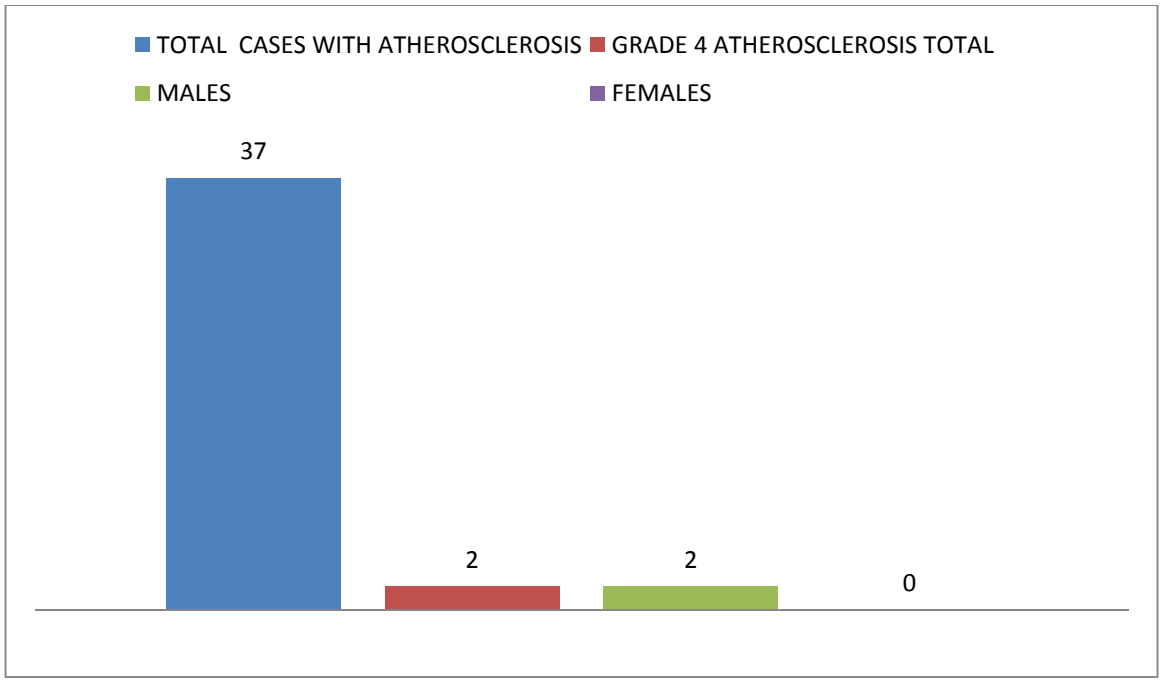
On analyzing the frequency and distribution of grade 4 atherosclerotic lesions, it is found that among the 37 cases with varying degree of atherosclerotic lesions, in right coronary artery among age group 21-25 years 0 case has grade 4 lesion, 0 case had grade 4 lesions in age group 26-30 years, 0 case had grade 4 lesions in age group 31-35 years, 0 case had grade 4 lesions in age group 36-40 years.

In left coronary artery among age group 21-25 years 1 case has grade 4 lesions, 0 cases had grade 4 lesions in age group 26-30 years, 1 case had grade 4 lesions in age group 31-35 years, 0 cases had grade 4 lesions in age group 36-40 years.



GRADE 4 ATHEROSCLEROSIS DISTRIBUTION AGEWISE- LCA

Overall grade 4 lesions are seen in right coronary artery in 0 cases and in left coronary it is seen in 2 cases. Of the 2 cases of lesions in left coronary artery 2 cases are males and 0 cases are females.



GRADE 4 ATHEROSCLEROSIS SEXWISE DISTRIBUTION- LCA

Among the 37 people who had some degree of atherosclerotic lesions in their right and left coronary artery the analysis of data for right coronary artery is as follows.

35 cases of the 37 had involvement of right coronary artery. Among those 35 cases, 26 were males and 9 were females.

In the male population maximum number of males were affected with grade 2 (10 cases) followed by grade 3 (9) cases, grade 1 (7 cases). Grade 4 lesions were not found in any age group in right coronary artery of male population.

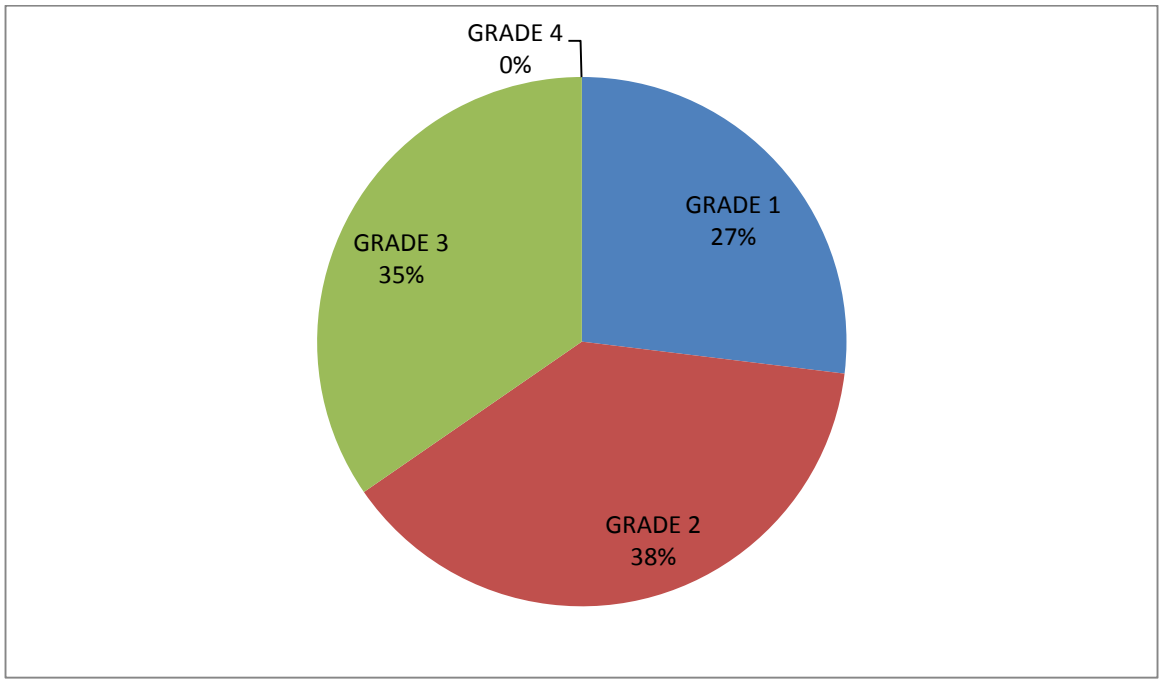
RIGHT CORONARY ARTERY GRADE - MALES

RCA GRADE MALES	NO OF CASES
Grade 1	7
Grade 2	10
Grade 3	9
Grade 4	0

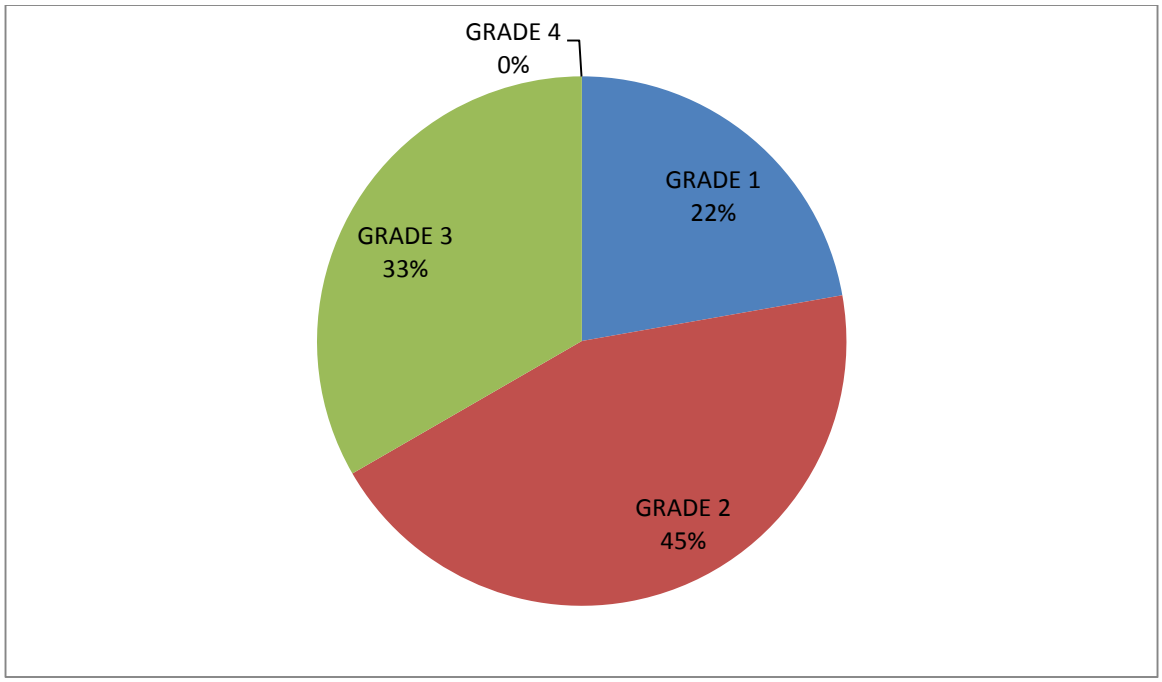
In the female population maximum number of females were affected with grade 2 (4 cases) followed by grade 3 (3 cases), grade 1 (2 cases). Grade 4 lesions were not found in any age group in right coronary artery of female population.

RIGHT CORONARY ARTERY GRADE - FEMALES

RCA GRADE FEMALES	NO OF CASES
Grade 1	2
Grade 2	4
Grade 3	3
Grade 4	0



ATHEROSCLEROTIC DISTRIBUTION IN RCA MALES

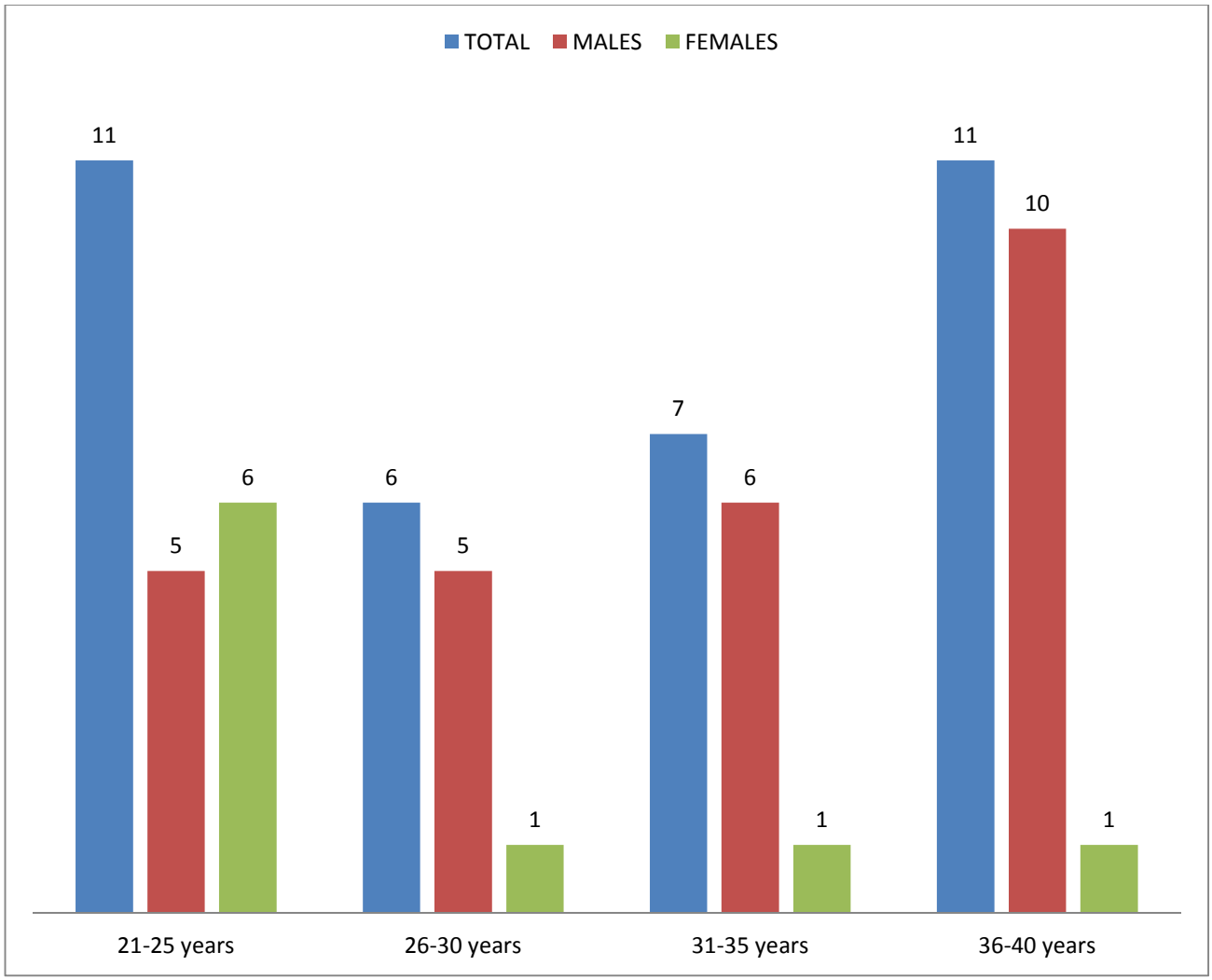


ATHEROSCLEROTIC DISTRIBUTION IN RCA FEMALES

Right coronary atherosclerosis is maximally and equally seen in age group 21-25 years and 36-40 years with 11 cases being involves out of which 5 cases were males and 6 cases were females in age group 21- 25 years and 10 cases were males and 1 case female in the age group 36-40 years. Following that age group 31-35 years had 7 cases which involved right coronary artery of which 6 cases were males and 1 case being female followed by age group 26-30 years which had 6 cases in which 5 cases were males and 1 case being female.

RCA DISTRIBUTION- AGEWISE

AGE GROUP YEARS	TOTAL	MALES	FEMALES
21-25	11	5	6
26-30	6	5	1
31-35	7	6	1
36-40	11	10	1



RCA INVOLVEMENT- AGEWISE DISTRIBUTION

31 cases of the 37 had involvement of left coronary artery. Among those 35 cases, 24 were males and 7 were females.

In the male population maximum number of males were affected equally with grade 2 and grade 3 (each with 8 cases) followed by grade 1 (6 cases). Grade 4 (2 cases) lesions were least found finding in left coronary artery of male population.

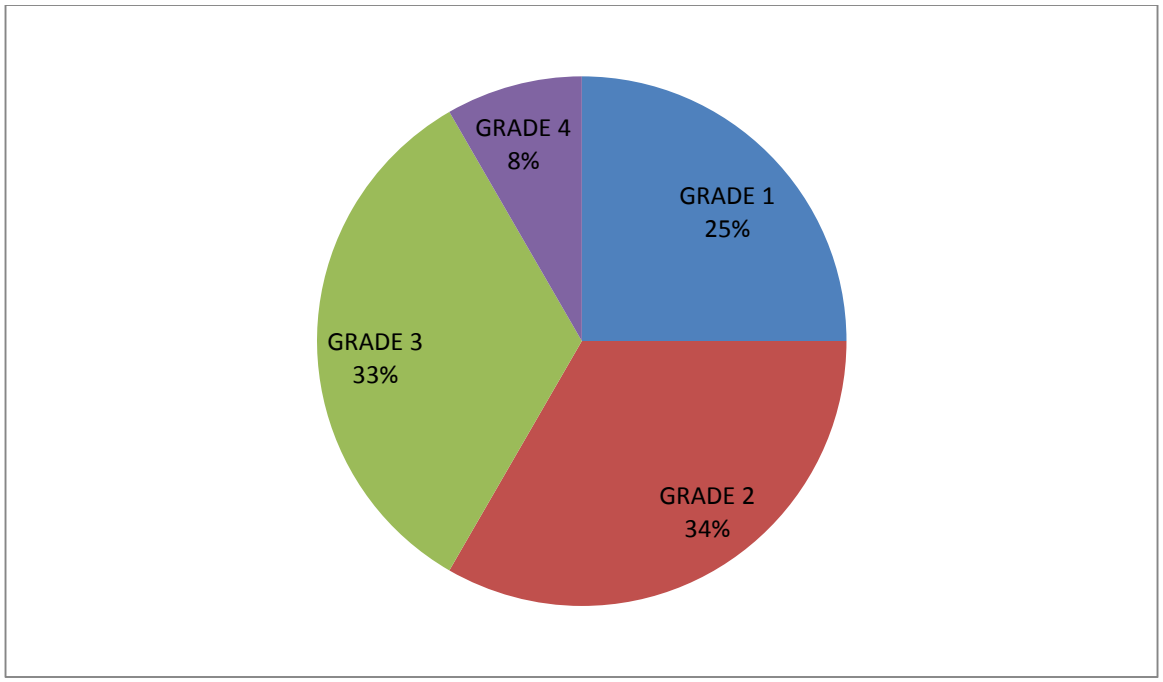
LEFT CORONARY ARTERY GRADE - MALES

LCA GRADE MALES	NO OF CASES
Grade 1	6
Grade 2	8
Grade 3	8
Grade 4	2

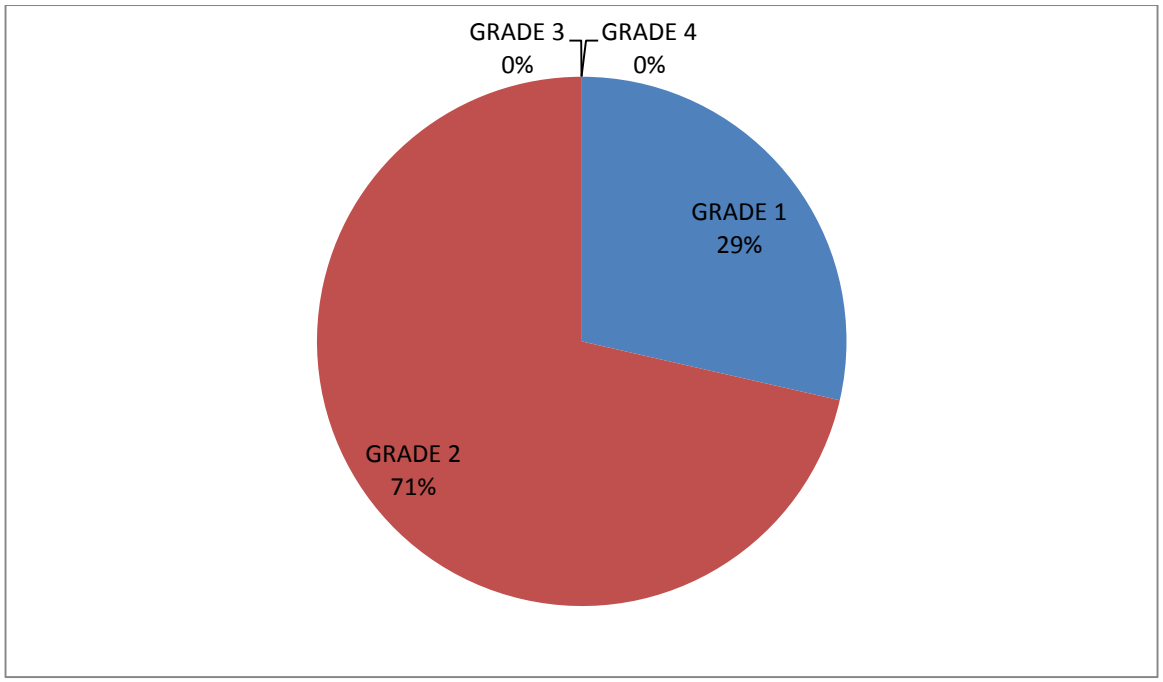
In the female population maximum number of females were affected with grade 2 (5 cases) followed by grade 1 (2 cases). Grade 3 and grade 4 lesions were not found in any age group in left coronary artery of female population.

LEFT CORONARY ARTERY GRADE - FEMALES

LCA GRADE FEMALES	NO OF CASES
Grade 1	2
Grade 2	5
Grade 3	0
Grade 4	0



ATHEROSCLEROTIC DISTRIBUTION IN LCA MALES

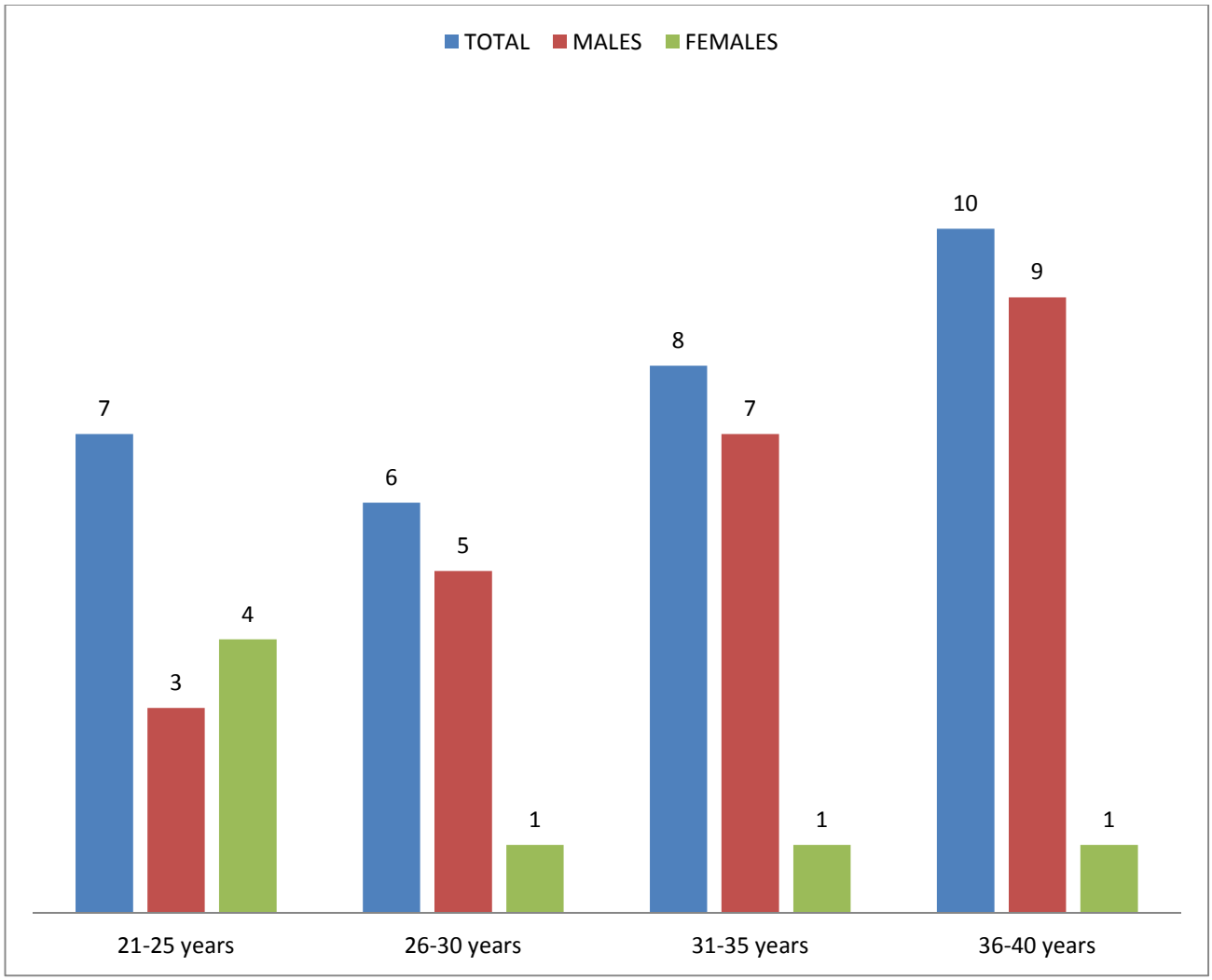


ATHEROSCLEROTIC DISTRIBUTION IN LCA FEMALES

Left coronary atherosclerosis is maximally seen in age group 36-40 years with 10 cases being involves out of which 9 cases were males and 1 cases were females followed by age group 31-35 years with 8 cases out of which 7 cases were males and one case being female. Following that age group 21-25 years had 7 cases which involved left coronary artery of which 3 cases were males and 4 cases being female followed by age group 26-30 years which had 6 cases in which 5 cases were males and 1 case being female.

LCA INVOLVEMENT- AGEWISE DISTRIBUTION

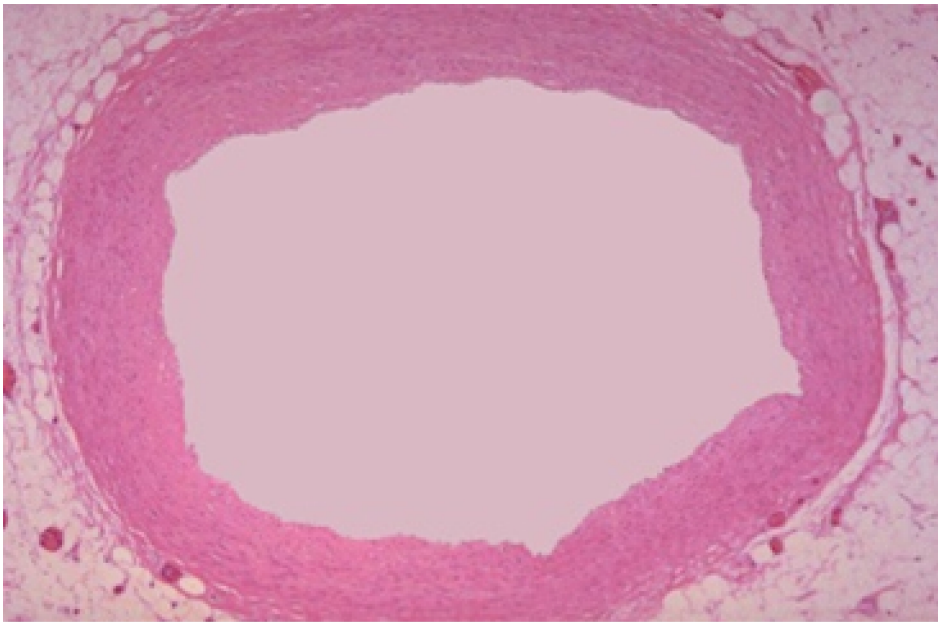
AGE GROUP YEARS	TOTAL	MALES	FEMALES
21-25	7	3	4
26-30	6	5	1
31-35	8	7	1
36-40	10	9	1



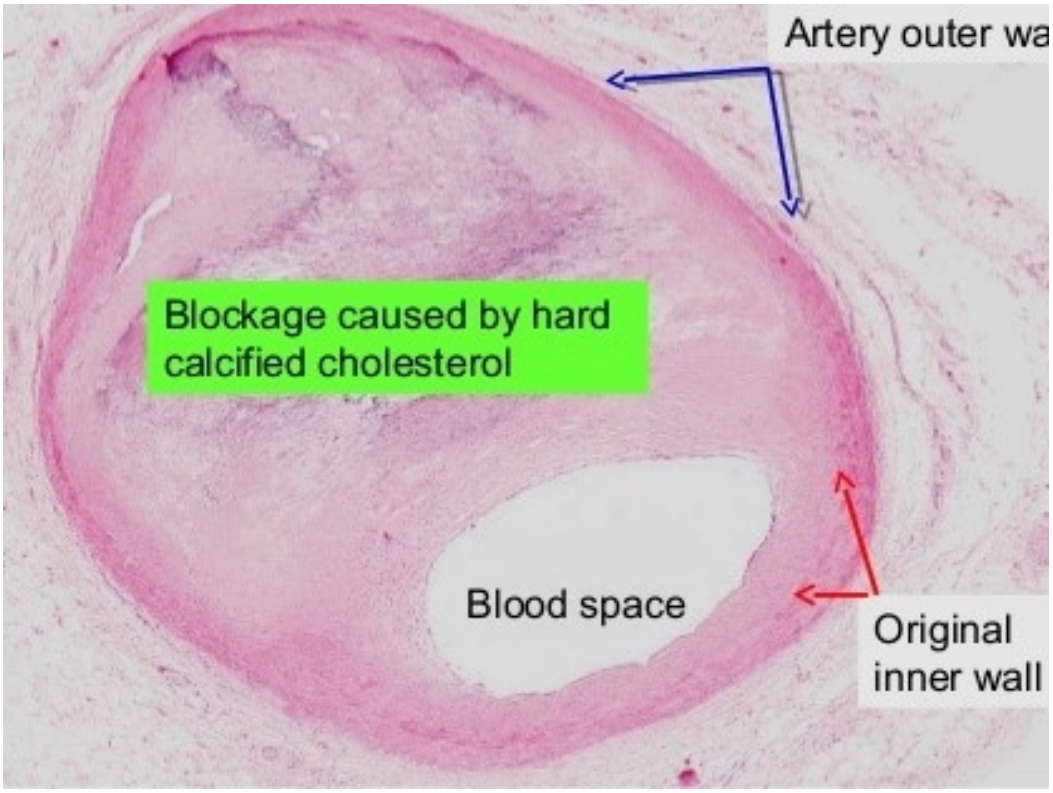
LCA INVOLVEMENT- AGEWISE DISTRIBUTION

HISTOPHOTOGRAM

NORMAL CORONARY ARTERY

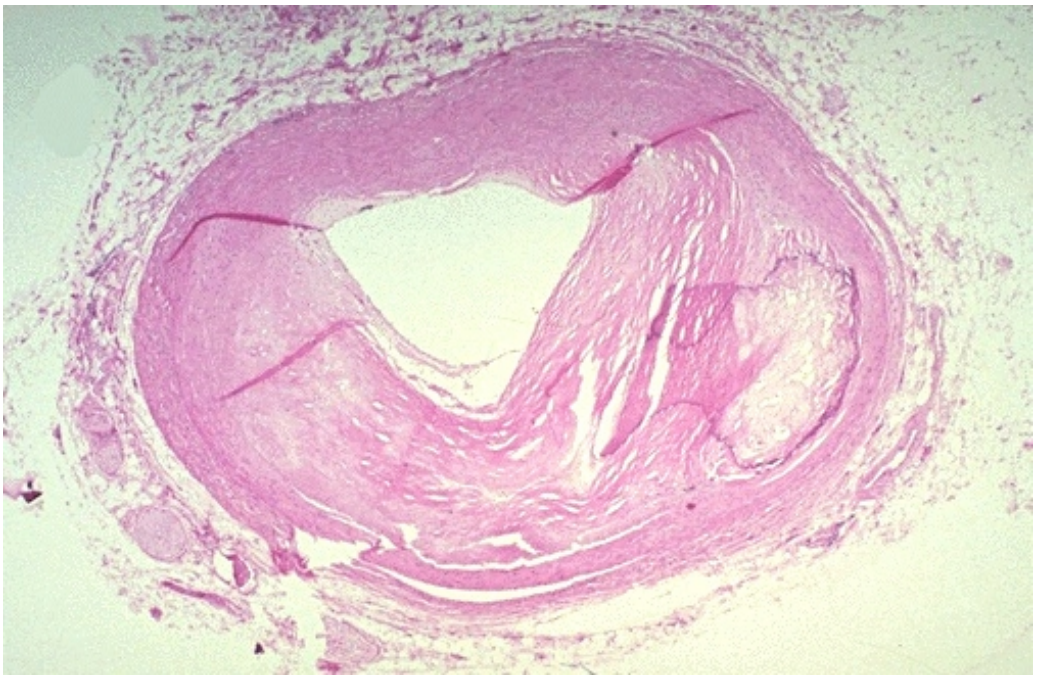


This is a normal coronary artery. The lumen is large, without any narrowing by atherosclerotic plaques. The muscular arterial wall is of normal proportion.

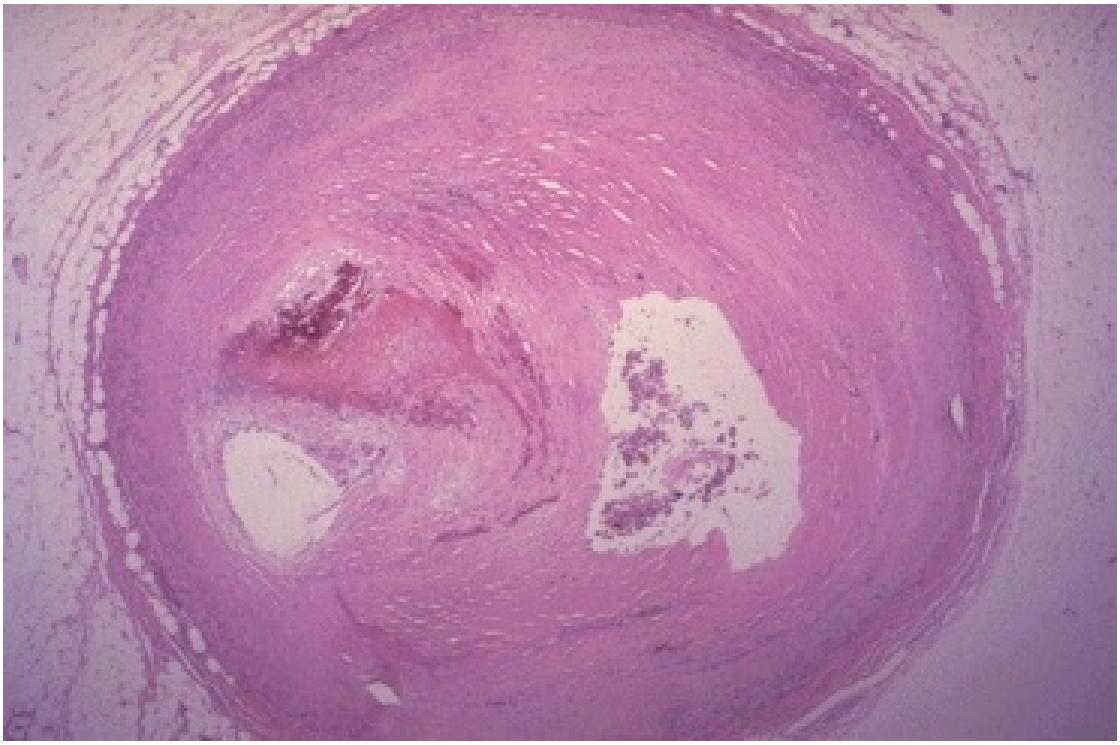


ATHEROSCLEROTIC CORONARY ARTERY

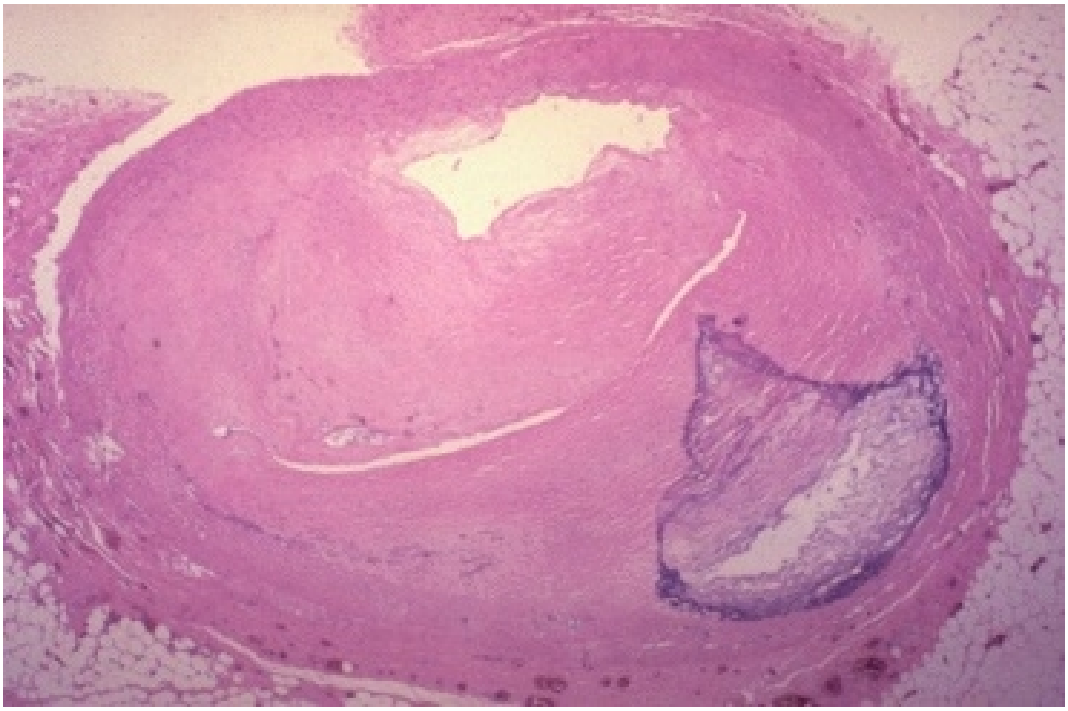
This section shows an atherosclerotic plaque obstructing the lumen of the coronary artery. Blue colour in the H&E stain represents calcified cholesterol.



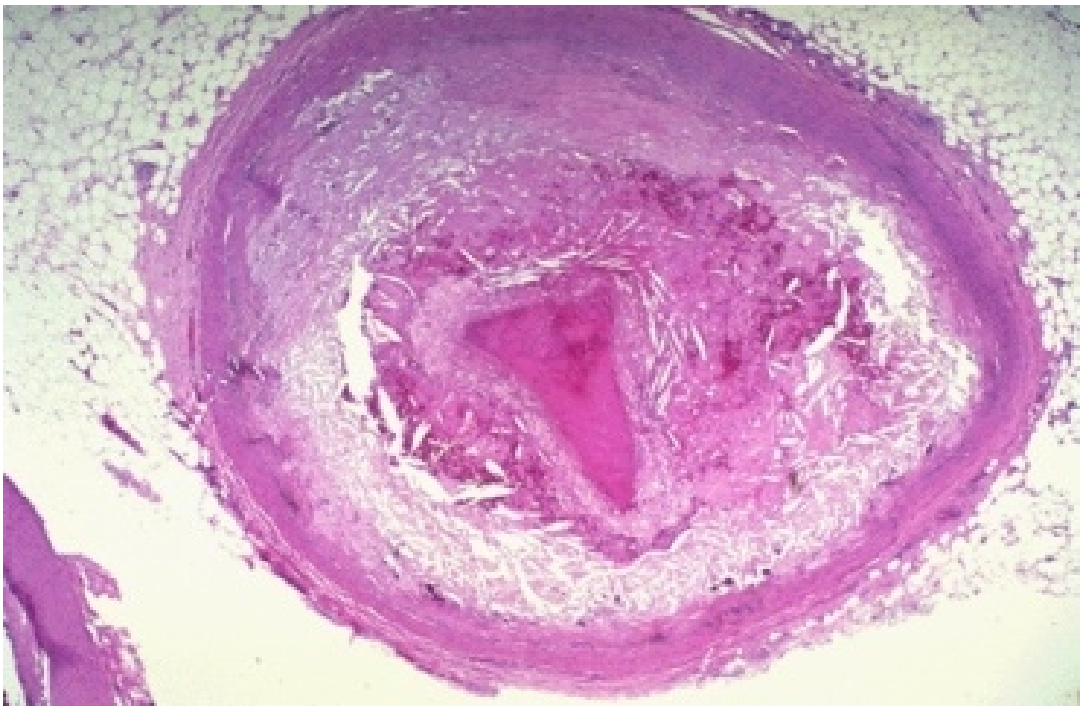
The coronary artery shown here has narrowing of the lumen due to build up of atherosclerotic plaque. Severe narrowing of lumen can lead to angina pectoris, myocardial infarction, sudden death.



This section of coronary artery demonstrates remote thrombosis with recanalization to leave only 2 narrow channels for blood flow.



there is severe narrowing of the lumen with a ‘complex’ atherosclerotic plaque in the lower right which appears blue in H&E stain due to calcification. Complex refers to hemorrhage, calcification or thrombus.



There is a pink to red recent thrombosis in this narrowed coronary artery. The open needle like spaces in the atheromatous plaque represents cholesterol clefts.

DISCUSSION

The autopsy study gives a means of understanding the basic process which sets the stage for clinically significant atherosclerotic coronary artery disease. There is no method to validate the coronary atherosclerosis in a living patient. the autopsy study provides a better representation and lay out of the prevalence of coronary atherosclerosis in living population.

The present study can be summarized and concluded as follows:

Overall 37 percent of the study population showed atherosclerosis in their coronary arteries in age group 21 – 40 years and of those who showed atherosclerosis of some degree in their coronary vessels, 41.2 percent of males had some degree of atherosclerotic narrowing in their coronary arteries and 28.2 percent of the females had some degree of atherosclerotic narrowing in their coronary arteries. Overall in the age group 21- 40 years, maximum prevalence of coronary atherosclerosis is seen in age group 36-40 years with overall incidence at 47.8 percent of cases. Surprisingly it is followed by age group 21- 25 years which had a prevalence of 44 percent which is followed by age group 31-35 years which had a prevalence of 33.3 percent and age group 26-30 years which had a prevalence of 25percent.

Overall in the age group 21- 40 years males had prevalence of 41percent and females had prevalence of 28 percent. Males showed around 1.5 times the prevalence of females. This ratio does not tally with the ratio given in KV KRISHNA DAS which states that men suffer 9 times more frequently than females. Right coronary artery is more commonly involved than left coronary artery with right coronary being involved in 35 cases out of 37 cases who had some degree of atherosclerotic narrowing in the coronary artery and left coronary being involved in 31 cases out of 37 cases who had some degree of atherosclerotic narrowing in the coronary artery. This prevalence tallies with P.C.DIKSHIT who gives an estimate of right coronary artery being involved in 24-46 percent of the cases and left coronary artery being involved in 0-10 percent of the cases.

The percentage of atherosclerosis in various studies ranged from 58% in the study by Mc Gill et al.[23], in United States to 77.3% by Enos et al.[24], among soldiers killed in action in Korea. In present study, the overall prevalence of coronary atherosclerosis was 37% which is far lesser than the above mentioned studies.

However the prevalence of coronary atherosclerosis in the 3rd decade is around 35 percent which is slightly lesser than 40 percent prevalence in the Bhargava's Study[25] (1975)which was conducted in North Karnataka.

The prevalence of coronary atherosclerosis in 4th decade of life in the present study gives 40.4% which is far lesser than 95 percent prevalence in Wig and Associates (1962) study conducted in North India[26] and 84 percent prevalence in the Bhargava's Study.

There is increased prevalence among males and females among age group 21- 40 years which is 41.7% in males and 46.2% in females which is higher than the prevalence in age group 26 – 30 years which are 28.6% in males and 14.3% in females. This clearly indicates that atherosclerosis in coronary arteries is significantly higher in younger age group and demands the need for early screening to detect or treat the patient so as to avoid deadly consequences of coronary atherosclerosis.

CONCLUSION

When the study is completed in native population of Tirunelveli, it is concluded that the prevalence of coronary atherosclerosis is considerably high and alarming. Males are more frequently affected than females probably due to protective effect of naturally available estrogens in females.

The results mandate the necessary steps to be taken in adopting healthy life style, avoiding stress, quitting smoking and alcohol, have a good regular exercise, proper and adequate sleep patterns, consuming balanced healthy green diets, importance of antioxidants intake so as to delay/avoid development of atherosclerotic lesions in the coronary vasculature which on certain progressive stage may cause severe disability or even loss of life causing severe impact on the quality of life of an individual and his family.

RECOMMENDATIONS

It is recommended that this type of studies has to be conducted in a large scale covering all classes of population and screening for coronary artery related diseases must begin at a far earlier stage for effective detection and treatment of such conditions and improve the overall health of individual, society and nation overall.

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PROFORMA

Assessment of prevalence of coronary atherosclerosis in age group 21-40 years:

Sl. no. / case no: Date:

PM No:

Police station & Crime no:

1. Name

2. Age from

   Driving license:

   Ration card:

   Voters ID:

   Mark sheets:

   Passport:

3. Sex: M / F

4. Address: as mentioned in police records

5.Married/unmarried: as mentioned in police records

6. Physical Examination:

Nourishment: (poor/ moderate/ well)

Built: (poor/moderate/ well)

7. Cause of death:

MASTER CHART

S.NO	PM NO	DATE	AGE	SEX	GRADE	
					RCA	LCA
1	224	24/02/2017	28	M	N	3
2	339	21/03/2017	36	M	1	1
3	422	09/04/2017	36	M	1	0
4	430	11/04/2017	26	M	N	N
5	444	14/07/2017	38	M	N	1
6	541	06/05/2017	38	M	N	N
7	554	11/05/2017	35	M	3	3
8	557	11/05/2017	23	F	1	N
9	566	12/05/2017	40	M	2	2
10	605	19/05/2017	35	M	N	N
11	622	22/05/2017	38	M	N	N
12	637	24/05/2017	34	F	N	N
13	639	25/05/2017	30	F	N	N
14	651	27/05/2017	36	F	N	N
15	671	30/05/2017	27	M	N	N
16	676	30/05/2017	33	F	N	N
17	681	01/06/2017	31	M	N	N
18	684	03/06/2017	33	M	1	3
19	700	06/06/2017	40	M	N	N
20	721	10/06/2017	24	M	N	N
21	737	14/06/2017	21	F	N	N
22	743	15/06/2017	22	F	N	N
23	747	16/06/2017	26	M	N	N
24	759	18/06/2017	21	M	N	N

25	814	29/06/2017	25	M	N	
26	817	30/06/2017	29	M	N	N
27	888	17/07/2017	31	M	N	N
28	909	20/07/2017	28	M	N	N
29	929	24/07/2017	38	M	1	N
30	941	27/07/2017	35	M	N	N
31	963	31/07/2017	36	M	N	N
32	978	04/08/2017	28	M	N	N
33	986	05/08/2017	29	M	2	3
34	995	07/08/2017	22	M	3	4
35	1021	13/08/2017	34	M	N	N
36	1397	05/11/2017	40	M	3	3
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38	1518	04/12/2017	34	F	N	N
39	1528	06/12/2017	28	M	N	N
40	1603	23/12/2017	35	M	2	3
41	1604	23/12/2017	38	F	3	1
42	29	06/01/2018	32	M	3	1
43	32	06/01/2018	40	M	1	1
44	37	08/01/2018	21	M	3	N
45	38	08/01/2018	21	F	2	2
46	47	09/01/2018	26	F	N	N
47	51	10/01/2018	23	F	3	2
48	88	16/01/2018	22	F	N	N
49	99	18/01/2018	29	M	1	N
50	100	18/01/2018	23	M	2	N
51	105	19/01/2018	26	F	N	N
52	124	22/01/2018	26	M	N	N

53	137	25/01/2018	27	M	3	2
54	177	01/02/2018	35	F	N	N
55	192	04/02/2018	31	F	N	N
56	194	05/02/2018	32	F	N	N
57	205	08/02/2018	25	F	3	N
58	208	08/02/2018	25	M	N	N
59	209	08/02/2018	29	M	2	2
60	212	09/02/2018	37	M	2	2
61	213	09/02/2018	35	M	3	3
62	254	17/02/2018	21	M	2	2
63	257	17/02/2018	21	F	N	N
64	279	24/02/2018	37	M	3	3
65	287	26/02/2018	25	M	2	2
66	292	27/02/2018	25	F	2	2
67	294	27/02/2018	30	M	2	2
68	306	02/03/2018	35	M	2	2
69	309	03/03/2018	23	F	N	N
70	325	06/03/2018	29	M	1	1
71	326	06/03/2018	27	F	1	1
72	331	07/03/2018	25	F	2	2
73	342	10/03/2018	40	M	1	1
74	376	17/03/2018	40	F	N	N
75	378	17/03/2018	22	M	N	N
76	394	21/03/2018	31	F	2	2
77	408	24/03/2018	39	F	N	N
78	451	01/04/2018	23	M	N	N
79	453	01/04/2018	26	M	N	N
80	464	03/04/2018	35	M	N	N

81	487	07/04/2018	35	M	N	N
82	507	12/04/2018	39	M	N	N
83	582	26/04/2018	35	M	1	1
84	661	10/05/2018	26	M	N	N
85	718	21/05/2018	36	M	3	3
86	780	30/05/2018	36	M	0	0
87	832	09/06/2018	26	M	N	N
88	835	10/06/2018	26	F	N	N
89	843	11/06/2018	32	M	N	N
90	844	11/06/2018	38	M	N	N
91	853	12/06/2018	33	F	N	N
92	869	15/06/2018	29	F	N	N
93	893	19/06/2018	29	M	N	N
94	900	19/06/2018	30	M	N	N
95	906	20/06/2018	28	M	N	N
96	910	21/06/2018	21	F	N	N
97	914	21/06/2018	31	M	N	N
98	957	28/06/2018	30	M	N	N
99	959	29/06/2018	25	M	N	N
100	961	29/06/2018	28	F	N	N